TAXONOMY AND PHYTOGEOGRAPHY OF TAIWANESE PTERIDOPHYTES

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Abstract: The position, topography, and climate of Taiwan are briefly described and shown to be very important for the richness of its pteridophytic flora. The history of botanical exploration of Taiwan is briefly described. It is pointed out that many nomenclatural problems pertaining to Asiatic plants can only be solved by work in European herbaria.

The present study is mainly based on the author's field work from 1968 to 1981 both on flora and vegetation, and herbarium studies in Japanese and western European herbaria. 617 taxa were critically examined; they include 4 new species, 13 new records, 15 new combinations, 33 new synonyms, 27 new corrections. One-third of the names had not been used in Taiwanese botanical literature before.

The elevational distribution patterns of Taiwanese pteridophytes agree very well with the vegetation zones in Taiwan. 43% of the Taiwanese pteridophytes belong to the warm-temperate forest zone. Most of the pteridophytes in the coniferous forest zones extend to or are mainly distributed in the Himalayan region. The closest relatives of endemic species in the coniferous forest zones were also studied; they show the same phytogeographical connections.

Selective criteria are proposed for comparing floras of neighbouring regions. An analysis of the distribution of selected pteridophytes in the broad-leaved forest zones gave the following results: the pteridophytic flora of Taiwan has very weak relationships with that of Malesia; the pteridophytes of subtropical Taiwan form links with those of the Ryukyus, SE. China, and the lowlands of Indo-China; the pteridophytes of the warm-temperate zone are closely related to those of SW. China (especially Szechwan, Yunnan, Kweichow), N. Indo-China, and NE. India. Thus, Taiwan can be said to have an East Asiatic, rather than a SE. Asiatic-Malesian fern flora, in spite of its position between the two areas.

1. INTRODUCTION

The main purpose of this paper is to elucidate the floristic affinities of the pteridophytes of Taiwan. The island is at a cross-roads of the Chinese, Japanese, and Philippine floras, as well as a considerable centre of endemism. The pteridophytes were chosen as Taiwan is very rich in species, and as they had never before been studied in a larger framework, incorporating the pteridophytic floras of mainland China, the Himalayas, India, Indo-China, Luzon, etc. Thus, a critical re-examination of the systematics of the group was required before any phytogeographical studies could be undertaken. This resulted in a considerable number of additions and corrections to the previous knowledge of the Taiwanese pteridophytes,

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as summed up on pp. 51–69. Subsequently, the principal phytogeographic ties of the pteridophytic flora could be established, and they could be broken down by the different vegetation zones; the conclusions are to be found on pp. 72–99.

The island of Taiwan (Fig. 1) is situated near the southeast coast of mainland China between 21°45′ and 25°56′ north latitude, and between 120° and 122° east longitude. It is thus about 125 km east of Fukien province of mainland China, 185 km southwest of Irimoteshima in the Ryukyu Islands, and 165 km north of Itbayat in the Batan Islands of the northern Philippines. Within these distances, the Chinese, Japanese and Philippine pteridophytic floras may be supposed to have about the same potential for the distribution of their spores to Taiwan and ideally the pteridophytic flora of Taiwan might be supposed to be influenced equally by these three neighbouring floras. The present study shows this to be otherwise.

There are 85 offshore islets near Taiwan, the more important ones are: Penghu Chuntao (=Pescadores Is. comprising 64 islets), Liukiu Yü, Kueishan Tao, Lü Tao, and Lan Yü. The floras of these islets are not much different from the lowland of Taiwan except that of Lan Yü. Botanically Lan Yü is very distinct from the Taiwan proper. For example, among the 617 Taiwanese pteridophytes taken into account in the present study, 12 are entirely confined to this islet. From the viewpoint of its floristic composition, Lan Yü is part of the Philippines and its flora is therefore excluded from the present work.

Taiwan is narrowly elliptical in shape, with the long axis oriented NNE-SSW. Its greatest length is 448 km, its greatest width is 144 km, and the total area is about 36,000 sq. km. Topographically Taiwan is a mountainous island, more than one third of its area being over 1,000 m. The mountain system of Taiwan can be divided into three main parts, i. e. Chungyang Shanmo, Haian Shanmo, and Tatun Shan area. The latter two parts, both lower than 1,000 m except for a few peaks, are very small areas compared to Chungyang Shanmo, and their pteridophytes may be treated as a part of the flora of Chungyang Shanmo. There are more than 48 peaks over 3,000 m, all in Chungyang Shanmo which is oriented NNE-SSW following the long axis of the island. The highest peak in the north is Nanhu Tashan (3,740 m). The pteridophytes on its northern slope are not much different from those of other parts of Taiwan except for three rare Japanese species: *Polystichum kiusiuense*, *Dryopteris lacera*, and *Dryopteris namegate*. The highest peak in the south is Peitawu Shan (3,090 m). Interestingly among the 67 Malesian pteridophytes in Taiwan (about 11% of Taiwanese pteridophytes) 38 are confined to its southern slope. The records of *Calymmodon*, *Monogramma*, *Paesia*, and most species of *Grammitidaceae* in Taiwan are from this southern slope. Although the southern slope of Peitawu Shan is considered by me as phytogeographically important because it is the northern limit in Asia of 15 Malesian species and three fern genera (*Calymmodon*, *Monogramma*, and *Paesia*). I do not think that botanically this southern slope should be regarded as forming part of Malesia or the Philippines (discussed in Chapter 5).

The richness of the pteridophytic flora of Taiwan may be due to: 1. its position across the Tropic of Cancer: this provides habitats for tropical and subtropical pteridophytes at low levels; 2. a steep and rugged high mountain system: The highest mountain attains 3,950 m and at least 12 mountain peaks are over 3,500 m, 48 over 3,000 m, besides, the forest line is at 3,500 m (up to 3,600 m in some places), so that there is a strong vertical vegetation zonation, permitting

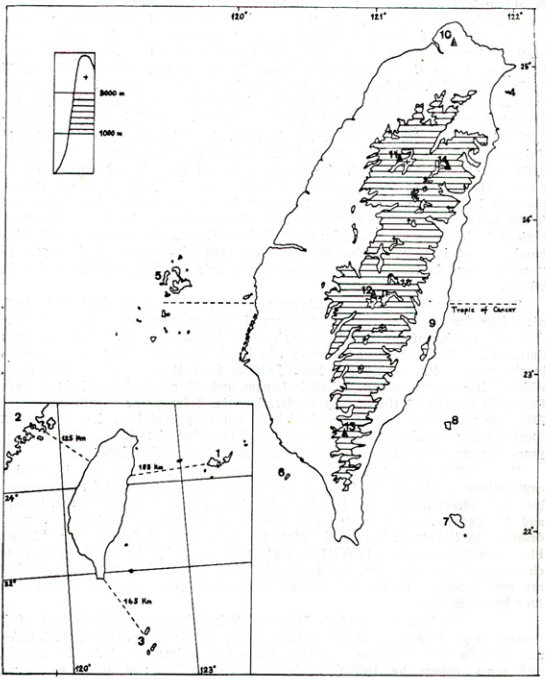

Fig. 1. Taiwan and its neighbouring regions, with localities mentioned in the text: 1. Irimote-shima of the Ryukyu Islands, 2. Fukien Province of China, 3. Batan Islands of the Philippines, 4. Kueishan Tao, 5. Penghu Chuntao, 6. Liuchiu Yü, 7. Lan Yü, 8. Lü Tao, 9. Haian Shanmo, 10. Tatun Shan area and Chihsing Shan, 11. Hsueh Shan, 12. Yü Shan, 13. Peitawu Shan, 14. Nanhu Tashan.

the presence not only of tropical and subtropical pteridophytes but also of temperate and alpine elements; 3. suitable climate: The average temperature in summer (June to September) in the lowland is between 26-28°C, and more than 15°C in winter (November to March). The temperatures in the northern and southern lowland are not very different in summer, but with a difference of 5-7°C in winter. In the Central Mountain Range the temperature decreases by 0.45°C in January and 0.55°C in July as the elevation decreases every 100 m, thus the average temperature at 1,000 m is about 11.5°C in January and 21.5°C in July, the average temperature at 2,000 m is 7°C in January and 16°C in July, and that at 3,000 m is 2.5°C in January and 10.5°C in July. Annual average precipitation in Taiwan is 2,582 mm and generally it is greater at higher elevations (may attain 3,000 mm) than in the lowland. As two branches of the warm Japanese current pass by the east and west coasts of Taiwan respectively, there is a northeast monsoon in winter and a southwest monsoon in summer, so that the rainy season in the northeastern regions of Taiwan is in winter and that in the southwestern regions is in summer. The climate of Taiwan is generally warm and with high humidity and is very suitable for the occurrence of different pteridophytes in general. Snow is rare in Taiwan and occurs only in high mountain regions in winter.

The pteridophytic flora of Taiwan was first explored by Wilford in 1858. Since then few works on the vascular flora of Taiwan have been published. The first one worthy of mention is Henry's work in 1896 "A list of plants from Formosa". This is actually a summary of all collections made by western collectors in the years between 1858 and 1895. Judging from these early fern collections, which I have seen, now deposited in London and other main herbaria in western Europe, it seems that these early explorations in Taiwan never extended above 700 m due to constant fear of the aboriginals, but they contain a few interesting species never found again by Japanese and Chinese botanists in the subsequent 80 years, for example, *Acrostichum aureum* and *Adiantum capillus-junonis*.

From 1895 to 1945, Taiwan was under Japanese rule and a few interesting explorations of high mountain areas were made. Within this period two Japanese botanists concentrating on the fern flora of Taiwan should be mentioned: B. Hayata and M. Tagawa. At least 164 new species of Taiwanese pteridophytes were described by Hayata, mainly in his "Materials for a Flora of Formosa" and "Icones Plantarum Formosanarum IV-VIII, X, 1914-1921", and 88 by Tagawa (for a complete checklist of his publications, see Iwatsuki 1978). All of their original materials are now deposited in the herbaria of Tokyo and Kyoto and most of them were seen by me in 1981.

In 1975, the first volume of the "Flora of Taiwan" was published, most of it devoted to pteridophytes. It was written mainly by Charles E. DeVol, W. C. Shieh and myself and is based on literature, herbarium material available in Taiwan, and some papers by DeVol (mainly on fern allies and primitive ferns, 1960-1972) and Shieh (genera Pteris, Cheilanthes, Adiantum, 1966-1970). 598 pteridophytes were included in the Flora of Taiwan Vol. 1, but my studies showed the presence of 617 taxa, with one third of their names changed (see Chapter 2 and 3).

If we survey the pteridophytic flora of Asia, we find that the scientific names are either independently used from region to region or sometimes wrongly applied,

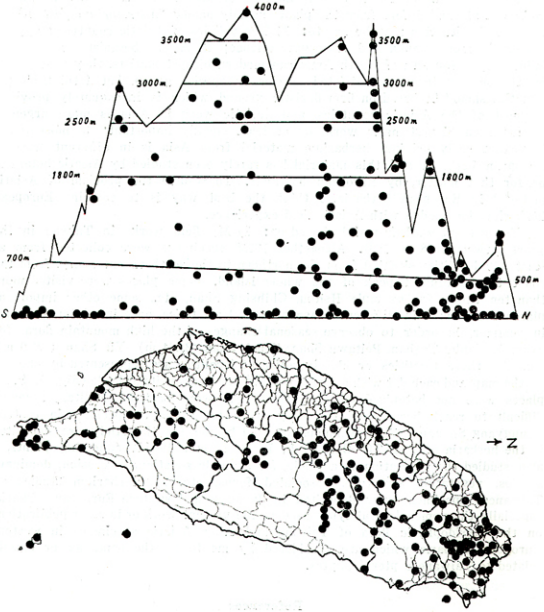

Fig. 2. The localities where the author has done field work shown on the lower, topographic map correspond with points on the upper, altitudinal figure.

and related species of neighbouring regions have never been comparatively studied. For example, the names *Athyrium delavayi* Christ from Southwest China, *Athyrium elegans* Tagawa from Japan, and *Athyrium subrigescens* Hayata from Taiwan, as revealed in my study, refer to the same species; the type of *Microsorium fortuni* (Moore) Ching, which I have seen in London, belongs to *Lepisorus* not to *Microsorium* at all, and differs from the plants usually named "*Microsorium fortuni*" in Asia. This situation may be due to: 1) The policies of Asiatic countries: applied science is more emphasised than pure science; 2) Asiatic botanists are strongly influced by European and North American modern biosystematists, they concentrate mostly on certain very restricted species or species group, but I think biosystematics should be based on firm floristic ground which is inadequately provided in most of the Asiatic countries, and floristic work in Asia is more urgently needed than biosystematic work, or at least equally important; 3) most of the important early original herbarium material from Asia is in different western European herbaria and this material has rarely been studied by Asiatic botanists or, for that matter, by European botanists. To resolve the problem of Asiatic material in European herbaria, I think the best way is to combine European herbarium knowledge with Asiatic field experiance.

The present work is mainly based on: 1) My field works in Taiwan in the years between 1968 to 1981. Altogether 13058 specimens were collected from at least 150 localities situated from the northern to the southern extremity, from the coast to the highest peak of the whole island. Some places were visited more than ten times, for example Hsitou, Chihsing Shan, etc., some other important places four times in different seasons or at least twice, once in winter and once in summer, in order to observe seasonal changes of the high mountain flora, for example Nanhu Tashan, Peitawu Shan, Hsueh Shan (3,884 m), Yü Shan (3,950 m), etc. All these localities or closely adjacent localities are represented by one dot on the map and each dot with a corresponding one to show its altitude (Fig. 2). Some places were not botanized either because they were located in military areas or difficult to reach because of the very steep topography, especially in eastern Chungyang Shanmo. The specimens collected by me for the study are deposited in the herbaria of TAI, TO, BM, K, L, P, B, Z, etc. Beside collecting plants, I also studied the vegetation as a whole, for example zonation, succession, dominant species, vegetation structure, associated ferns, etc. 2) Herbarium studies on Taiwanese specimens now deposited in Japanese and western European herbaria, especially the nomenclatural types used in the present work or in other publications on the pteridophytic flora of Taiwan, and other Asiatic specimens in western European herbaria which are considered by me to be the same as or closely related to Taiwanese pteridophytes.

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2. A REVISED CHECKLIST OF THE FERNS AND FERN ALLIES OF TAIWAN

Since the publication of Flora of Taiwan Vol. 1 in 1975, nine years have passed, during which a few papers were published as supplements: Lai (1976), DeVol et Kuo (1978), Kuo et Jeng (1978), DeVol (1979), DeVol et Kuo (1979), Kuo (1982). But still some names and species were found to have been overlooked because the early collections from Taiwan are in herbaria in Japan and western Europe. Some others had previously been misidentified and a few new additions are due to new discoveries. During the years between 1981-84, the author had opportunities to visit important herbaria in Tokyo, Kyoto, Leiden, London, Kew, Berlin, and Paris, in order to study early collections from Taiwan and most of the types of the names now used in Taiwan; also to establish their exact distribution. The following is a summary of the present knowledge of the pteridophytic flora of Taiwan. There are 617 species on the list (for the species entirely confined to Lan Yü*, an empty delta is placed before their scientific names) with 204 comments on the taxonomy or nomenclature, of which 84 comments are the present author's contributions, each marked with an asterisk behind the number. The comments are in brackets after scientific names and are assembled in Chapter 3. The systematic, taxonomic and nomenclatural references are also listed in Chapter 3. The system of Tryon et Tryon (1982) is mainly adopted for this list except for *Diplopterygium*, *Cyathea*, *Arachniodes*, *Acystopteris*, and *Drynarieae*. As their system mainly applies to American pteridophytes and some Asiatic genera of *Polypodiaceae* and *Grammitidaceae* are not clearly treated, for this purpose I use the system of Ching (1940a) as supplement. The name in the right-hand margin of this list are those employed in Flora of Taiwan Vol. 1. If the name given there are exactly the same as the names used in the present work, this is indicated by "—", or, if the names are not mentioned in Flora of Taiwan Vol. 1, this is indicated by "Not mentioned".

I. Lycopodiaceae

(1) *Lycopodium*

1. *L. appressum* (Desv.) V. Petr. (1) — *L. selago* var. *appressum*
   Arctic, Japan, China (Tibet, Shensi, Szechwan, Yunnan)
2. *L. somae* Hayata —
   Japan (Yakushima), Luzon
3. *L. quasipolytrichoides* Hayata —
   Endemic
4. *L. serratum* Thunb. (2*) — *L. serratum* var. *longipetiolatum*
   L. serratum var. *myriophyllifolium*

* Lan Yü=Orchid I.=Botel Tobago=Kotosyo

Ussuri, Sakhalin, Japan, NE. to SW. China, E. Himalaya, India, Ceylon, Indo-China, Malesia, Pacific Island

5. "*L. phlegmaria* L." (3) —
S. Japan, Ryukyus, China (S. Yunnan, Kwangtung, Kwangsi)
6. *L. salvinioides* (Hert.) Tagawa —
Ryukyus, Philippines, Borneo, Moluccas
7. *L. fordii* Baker —
China (Kwangtung, Fukien, Kiangsi, Kweichow, Kwangsi, Yunnan, Chekiang), Japan
8. *L. cunninghamioides* Hayata —
Endemic
9. *L. cryptomerianum* Maxim. —
Japan, Korea (Quelpart)
10. *L. squarrosum* Forst. —
Paleotropics
11. *L. taiwanense* Kuo (4*) *L. pulcherrimum*
Endemic
12. *L. carinatum* Desv. —
S. China (Kwangtung, Kwangsi, Yunnan), Ryukyus, Malesia, Pacific Islands
13. *L. fargesii* Hert. —
China (Szechwan, Kwangsi, Kweichow), Japan
14. *L. sieboldii* Miq. —
Japan
15. *L. cernuum* L. —
Tropics and subtropics of the whole world
16. *L. pseudoclavatum* Ching (5) *L. clavatum*, in part
China (Tibet, Yunnan, Szechwan, Kweichow), Nepal, Bhutan, N. India, N. Burma
17. *L. japonicum* Thunb. (6) *L. clavatum*, in part
China (Tibet, Szechwan, Kweichow, Kiangsi, Fukien, Anhwei, Chekiang, Kiangsu, Hunan, Hupeh, Kwangtung, Kwangsi, Sinkiang), Japan, N. Burma, N. India, Bhutan, Nepal, Indo-China, Malaysia, Indonesia, Philippines
18. *L. annotinum* L. —
Temperate regions of N. Hemisphere
19. *L. juniperoideum* Sw. (7) *L. obscurum*
E. Siberia, Far East of the U.S.S.R., Japan, NE. China, North America
20. *L. veitchii* Christ —
China (Tibet, Szechwan, Hupeh, Yunnan), Burma
21. *L. multispicatum* Wilce (8) *L. complanatum*, in part
SW. China, N. Vietnam, Luzon
22. *L. yueshanense* Kuo (9*) *L. complanatum*, in part
Assam, China (Kweichow, Yunnan, Szechwan), N. Vietnam
23. *L. casuarinoides* Spring —
Tropical Asia, Pacific Islands

II. Selaginellaceae

(2) *Selaginella* (10)*

24. *S. remotifolia* Spring —

Japan, Ryukyus, China (Szechwan, Kiangsi, Kweichow, Yunnan, Fukien), Philippines, south to Sumatra, Java, New Guinea

25. *S. delicatula* (Desv. ex Poir.) Alston —
S. China, India, Indo-China, Philippines, Borneo, Moluccas
26. *S. repanda* (Desv. ex Poir.) Spring —
India, S. China (Kwangsi), Philippines, south to Java, Lesser Sunda Islands
27. *S. doederleinii* Hieron. —
S. China, Indo-China, Ryukyus, S. Japan
28. *S. stauntoniana* Spring —
From S. Manchuria and Monogolia to E. China (Kiangsi) and Korea
29. *S. moellendorffii* Hieron. —
S. China, Indo-China, Ryukyus
30. *S. involvens* (Sw.) Spring —
India, from S. China to Tibet, Korea (Quelpart), Japan, Ryukyus, through SE. Asia to Celebes and Flores
31. *S. tamariscina* (Pal. Beauv.) Spring —
Far East of the U.S.S.R., Japan, Ryukyus, Korea, China, N. India, Indo-China, Philippines, Bonin Is.
32. *S. nipponica* Franch. et Sav. (11*) —
China (its southern provinces except Kwangtung, Kwangsi, north to Shensi, Honan, Shantung, southwest to Yunnan), also in Japan
33. *S. ciliaris* (Retz.) Spring —
India, S. China (Kwangtung), Malesia, N. Australia
34. *S. boninensis* Bak. —
Bonin Is., Luzon, Vietnam
35. *S. labordei* Hieron. —
China (Yunnan, Kweichow, Kwangsi, Szechwan, Hunan, Anhwei, Hupeh, Shensi)
36. *S. heterostachys* Bak. —
S. China, Japan, N. Vietnam
37. *S. leptophylla* Bak. —
S. China

III. Isoetaceae

(3) *Isoetes*

38. *I. taiwanensis* DeVol —
Endemic

IV. Equisetaceae

(4) *Equisetum*

39. *E. ramosissimum* Desf. subsp. *ramosissimum* —
S. and E. Africa, Madagascar, Mauritius, Mediterranean Africa, Canary Islands, Azores, S. and C. Europe, Asia Minor, Transcaucasia, Mongolia, China (Sinkiang, Tibet and central provinces), Korea, Japan, N. India
40. *E. ramosissimum* subsp. *debile* (Roxb.) Hauke —
India, Ceylon, Himalaya, Nepal, Burma, S. China, Indo-China, Philippines, Indonesia, New Guinea, New Hebrides, New Caledonia, Fiji

V. Psilotaceae

(5) *Psilotum*

41. *Psilotum nudum* (L.) Pal. Beauv. —
Tropical and subtropical parts of the whole world

VI. Ophioglossaceae

(6) *Botrychium*

42. *B. lunaria* (L.) Sw. —
Temperate regions of the N. Hemisphere, Patagonia, New Zealand, S. Australia, Tasmania

43. *B. lanuginosum* Wall. ex Hook. et Grev. —
Ceylon, India, E. Himalaya, S. China, Malesia

44. *B. ternatum* (Thunb.) Sw. —
Japan, Korea, S. China (Kwantung, Kweichow), Indo-China, Himalaya

45. *B. daucifolium* Wall. ex Hook. et Grev. (12*) *B. daucifolium*
B. japonicum
Japan, Ryukyus, S. China, India, Ceylon, Philippines, Borneo, Java, Fiji

(7) *Ophioglossum*

46. *O. pendulum* L. *Ophioderma pendulum*
Old World tropics

47. *O. petiolatum* Hook. —
World tropics

48. *O. austroasiaticum* Nishida (13) *O. vulgatum*
Borneo *O. austro-asiaticum*

△49. *O. reticulatum* L. (14*) Not mentioned
World tropics

(8) *Helminthostachys*

50. *H. zeylanica* (L.) Hook. —
From Ceylon and India through Malesia to the Caroline Islands and to New Caledonia, north to Assam, S. China (S. Yunnan, Hainan), Ryukyus, south to Australia

VII. Marattiaceae

(9) *Marattia*

△51. *M. pellucida* Presl —
Philippines

(10) *Angiopteris*

52. *A. lygodiifolia* Rosenst. —
Japan, Ryukyus

53. *A. palmiformis* (Cav.) C. Chr. —
Philippines

(11) *Archangiopteris*

54. *A. somae* Hayata *A. henryi* var. *somai*
Endemic

55. *A. itoi* Shieh
Endemic

VIII. Osmundaceae

(12) *Osmunda*

56. *O. japonica* Thunb. —
Sakhalin, Korea, Japan, China, Himalaya, Indo-China, Philippines

57. *O. cinnamomea* L. (15) *O. cinnamomea* var. *fokiensis*
Temperate regions of North America, Far East of the U.S.S.R., Korea, Japan, China, Himalaya, Upper Burma, NE. Thailand, Vietnam

58. *O. claytoniana* L. (16) *O. claytoniana* var. *pilosa*
North America, Far East of the U.S.S.R., Japan, China, Himalaya

59. *O. banksiaefolia* (Pr.) Kuhn —
Japan, Bonin Is., China, Philippines

IX. Schizaeaceae

(13) *Lygodium*

60. *L. japonicum* (Thunb.) Sw. —
Ceylon, from Himalaya (Kashmir eastwards) to China (Chekiang), Korea, Japan, south to Indo-China, Malesia

61. *L. microphyllum* (Cav.) R. Brown —
Tropics of the Old World, from Africa to Melanesia and Australia, north to Bengal, Hong Kong and Ryukyus

(14) *Schizaea*

62. *S. dichotoma* (L.) Sm. —
Tropics of the Old World, north to Ryukyus, west to Madagascar, and southeast to Polynesia, New Zealand and Australia

63. *S. digitata* (L.) Sw. —
Tropical Asia, north to NE. India and S. China (Kwangtung, Hainan), also in Microneisa, Malesia (except E. Java and Lesser Sunda Islands)

X. Marsileaceae

(15) *Marsilea*

64. *M. minuta* L. (17) *M. crenata*
Tropics of the Old World

XI. Gleicheniaceae

(16) *Diplopterygium*

65. *D. glaucum* (Houtt.) Nakai —
Japan, Ryukyus, S. Korea, S. China

66. *D. blotianum* (C. Chr.) Nakai —
S. China, Indo-China, Malay Peninsula

67. *D. chinense* (Rosenst.) DeVol —
S. China (Fukien, Kwangtung, Kwangsi, Szechwan, Kweichow), Tonkin

68. *D. laevissimum* (Christ) Nakai —
Japan, S. China

(17) *Dicranopteris* (18*)

69. *D. linearis* (Burm. f.) Underw. *D. linearis* var. *linearis*
Tropical and subtropical Old World, north to C. Japan

70. *D. subpectinata* (Christ) Kuo (19*) — *D. linearis* var. *subpectinata*
Thailand, Malay Peninsula, Borneo, Sumatra
71. *D. tetraphylla* (Rosenst.) Kuo (20*) — *D. linearis* var. *tetraphylla*
S. China (Kwangtung, Hainan), Indo-China, Sumatra
72. *D. taiwanensis* Ching et Chiu (21) — *D. linearis* var. *montana*
Ceylon, S. India, Sikkim, Sumatra, Malay Peninsula, Java, Borneo, Moluccas

XII. Dipteridaceae

(18) *Dipteris*
73. *D. conjugata* Reinw.
Ryukyus, S. China (Yunnan), Indo-China, Malay Peninsula, Sumatra, east to New Caledonia, Fiji

XIII. Cheiropleuriaceae

(19) *Cheiropleuria*
74. *C. bicuspis* (Bl.) Pr.
Japan, Ryukyus, S. China (Kwangtung, Kwangsi), Indo-China, southeast to New Guinea

XIV. Hymenophyllaceae

(20) *Hymenophyllum*
75. *H. devolii* Lai (22) — *H. taiwanense*
Endemic
76. *H. simonsianum* Hook. (23*) — *H. alishanense*
N. India, Sikkim, S. China (Yunnan)
77. *H. barbatum* (v.d. Bosch) Bak. (24*) — *H. barbatum*, *H. simonsianum*
Japan, Ryukyus, Korea, E. and S. China, Indo-China, India
78. *H. blandum* Racib. — *Meringium blandum*
Java, Sumatra, Borneo, Malay Peninsula, Philippines
79. *H. denticulatum* Sw. — *M. denticulatum*
Ryukyus, Hainan, Kwangsi, Indo-China, N. India, Ceylon through Malesia to Fiji
80. *H. holochilum* (v.d. Bosch) C. Chr. — *M. holochilum*
Thailand, Malesia
81. *H. wrightii* v.d. Bosch — *Mecodium wrightii*
Sakhalin, Japan, Korea, coastal British Columbia
82. *H. oligosorum* Makino — *M. oligosorum*
Japan, Korea
83. *H. paniculiflorum* Presl (25*) — Not mentioned
China (Szechwan, Yunnan), Philippines, Borneo, Java
84. *H. microsorum* v.d. Bosch (26) — *M. polyanthos*
From Japan to Sw. China, Indo-China
85. *H. productum* Kunze (27) — Not mentioned
Indo-China, Malay Peninsula, Sumatra, Java, Borneo, Philippines
86. *H. badium* Hook. et Grev. (28*) — *M. badium*, *M. crispato-alatum*

S. Japan, S. China, N. India, Indo-China, Malesia

87. *H. javanicum* Sprengel (29*) — *M. fimbriatum*, *M. javanicum*

From Ryukyus to Australia, Ceylon to Fiji

88. *H. taiwanense* (Tagawa) Morton (30) — Not mentioned

Endemic

(21) *Trichomanes*

89. *T. nitidulum* v.d. Bosch — *Microtrichomanes nitidulum*

Tonkin, Ceylon, Sumatra, Java

90. *T. saxifragoides* Presl (31) — *Gonocormus minutus*

Tropics of the Old World, north to China, Japan and Ussuri, east to Polynesia

91. *T. proliferum* Bl. (32) — Not mentioned

Malesia

92. *T. auriculatum* Bl. — *Vandenboschia auriculata*

N. India, S. and SW. China, Japan, Indo-China, Malesia

93. *T. maximum* Bl. — *V. maxima*

S. Japan, Ryukyus, Indo-China, Malesia, east to Tahiti, south to Queensland

94. *T. birmanicum* Bedd. (33) — *V. orientalis*, *V. naseana*

Burma, N. Indo-China, S. China, Korea, Japan and Ryukyus

95. *T. latifrons* v.d. Bosch (34*) — *V. latifrons*, *V. pyxidifera*

Bhutan, China (Yunnan, Kweichow), Philippines

96. *T. clathratum* Tagawa (35) — Not mentioned

Endemic

97. *T. cumingii* (Presl) C. Chr. — *Abrodictyum cumingii*

Philippines, Celebes, Moluccas, New Guinea

98. *T. apiifolium* Presl — *Callistopteris apiifolia*

Japan (Yakushima), Ryukyus, Thailand, Nicobar Is., Malesia (except Malay Peninsula), east to Fiji

99. *T. thysanostomum* Makino (36*) — *Nesopteris thysanostoma*, *N. grandis*

Ryukyus, Luzon

100. *T. pallidum* Bl. — *Pleuromanes pallidum*

S. China (Hainan) and Philippines southwards, from Ceylon to Polynesia

101. *T. humile* Forst. f. — *Crepidophyllum humile*

Thailand, Malesia, east to Tahiti

102. *T. latealatum* (v.d. Bosch) Christ (37*) — *Crepidomanes latealatum*, *C. palmifolium*

N. India, Indo-China, S. China, Korea, Japan, Malay Peninsula, Sumatra

103. *T. bilabiatum* Nees et Bl. — *C. bilabiatum*

Tonkin, Thailand, Malay Peninsula, Java, Sumatra, Ceylon

104. *T. latemarginale* Eaton — *C. latemarginale*

Assam, Indo-China, S. China, Malay Peninsula

△105. *T. kurzii* Bedd. (38*) — *C. latemarginale*

Burma, Thailand

106. *T. tahitense* Nadeaud (39) — *Microgonium omphalodes*

Ryukyus, Java, Ambon, Australia, Micronesia, Melanessia, Polynesia

107. *T. motleyi* v.d. Bosch — *M. motleyi*
Ceylon, Burma, Indo-China, Ryukyus, Malesia, Solomon Islands
108. *T. bimarginatum* v.d. Bosch — *M. bimarginatum*
Ryukyus, Indo-China, S. India, Ceylon, Malesia, Australia, east to Samoa
109. *T. laciniatum* Roxburgh — *Cephalomanes laciniatum*
Ryukyus, Philippines, Moluccas
110. *T. obscurum* Bl. — *Selenodesmium obscurum*
Tropics of the Old World

XV. **Plagiogyriaceae**

(22) *Plagiogyria*
111. *P. formosana* Nakai (40) — *P. glauca* var. *philippinensis*
Philippines
112. *P. euphlebia* (Kunze) Mett. (41*) — *P. euphlebia*
P. euphlebia var. *grandis*
Korea, Japan, Ryukyus, S. China, Philippines, Indo-China, Himalaya
113. *P. koidzumii* Tagawa — —
Ryukyus
114. *P. stenoptera* (Hance) Diels — —
S. Japan, S. China, Philippines
115. *P. dunnii* Copel. — —
S. China
116. *P. rankanensis* Hayata (42) — *P. adnata*
Japan, Ryukyus, S. China, Philippines, Thailand
117. *P. japonica* Nakai — —
Japan, Korea, S. China

XVI. **Dicksoniaceae**

(23) *Cibotium*
118. *C. taiwanense* Kuo (43*) — *C. cumingii*
Endemic
119. *C. barometz* (L.) J. Sm. — —
NE. India, S. China, S. Japan, south to Malesia

XVII. **Cyatheaceae**

(24) *Cyathea* (44)
120. *C. hancockii* Copel. (45) — *Alsophila denticulata*
Japan, Ryukyus, Hong Kong
121. *C. metteniana* (Hance) C. Chr. et Tard.-Blot — *A. metteniana*
S. Japan, Ryukyus, S. China, Indo-China
122. *C. podophylla* (Hook.) Copel. — *A. podophylla*
Ryukyus, S. China, Indo-China
123. *C. spinulosa* Wall. ex Hook. — *A. spinulosa*
India, E. Himalaya, Burma, N. Thailand, S. China, S. Japan, Ryukyus
124. *C. loheri* Christ — *A. loheri*
Philippines, N. Borneo
△125. *C. fenicis* Copel. — *A. fenicis*

Philippines (N. Luzon, Batan Island)
126. *C. lepifera* (Hook.) Copel — *Sphaeropteris lepifera*
Ryukyus, Philippines, S. China (Kwangtung)

XVIII. Pteridaceae

XVIII-I. Taenitideae

(25) *Pityrogramma*
127. *P. calomelanos* (L.) Link —
Native of tropical America, naturalized in Taiwan
(26) *Anogramma*
128. *A. leptophylla* (L.) Link —
Europe, Africa, Madagascar, India, Java, Australia, New Zealand, S. and C. America
(27) *Coniogramme*
129. *C. fraxinea* (Don) Diels —
S. India, Himalaya, SW. China, Philippines, Java
130. *C. intermedia* Hieron. —
Himalaya, Indo-China, China, Korea, Japan, Sakhalin, Kuril Is.
131. *C. japonica* (Thunb.) Diels —
Japan, Korea, S. China
132. *C. procera* Fée —
Himalaya, SW. China

XVIII-II. Cheilantheae

(28) "*Gymnopteris*" (46)
133. *G. vestita* (Hook.) Underw. —
SW. China, Himalaya
(29) "*Hemionitis*" (47)
134. *H. arifolia* (Burm.) Moore —
India, Ceylon, Indo-China, S. China (S. Yunnan, Hainan), Malesia
(30) *Cheilanthes*
135. *C. argentea* (Gmel.) Kunze —
Siberia, Japan, Korea, China, India, N. Burma
136. *C. subargentea* (Ching et S.K. Wu) Kuo (48*) — Not mentioned
China (Tsinghai, Tibet, Yunnan, Szechwan)
137. *C. agetae* (Saiki) Kuo (49*) — *C. farinosa*, in part
Endemic
138. ***C. dealbata* D. Don (50) — *C. farinosa*, in part
SW. China, Nepal, India (Nilgiris), Burma, Thailand, Indochina, Java
139. *C. chusana* Hook. (51*) — *C. mysurensis*
Japan, Korea, China, Indo-China, Philippines
140. *C. tenuifolia* (Burm.) Sw. —
S. China, India, Ceylon, Indo-China, Malesia, Australia, New Zealand, Polynesia
141. *C. hirsuta* (Poir.) Mett. —

** C. krameri Fr. et Sav.: another Cheilanthes species should be added after C. dealbata, distributed in Japan, SW. China, Himalaya.

Tropical Asia, north to S. China (Fukien, Kwangtung, Kwangsi)

142. *C. nitidula* Hook. — *Mildella henryi*
China, Indo-China, Himalaya

143. *C. concolor* (Langsed. et Fisch.) Schelpe — *Doryopteris concolor*
India, China, Indo-China, Malesia, Australia to Polynesia

(31) *Cryptogramma*

144. *C. brunoniana* Wall. ex Hook. et Grev. —
Himalaya, China (Tibet, NE. Yunnan)

145. *C. stelleri* (Gmel.) Prantl —
North America, Siberia, Japan, China, Himalaya

(32) *Onychium*

146. *O. siliculosum* (Desv.) C. Chr. —
India, Indo-China, S. China (Yunnan), Malesia, Polynesia

147. *O. japonicum* (Thunb.) Kunze —
Japan, Ryukyus, S. Korea, S. China, India, Malesia

148. *O. lucidum* (Don) Sprengel (52*) — *O. contiguum*
SW. China, E. Himalaya, NE. India, N. Burma

XVIII-III. **Ceratopterideae**

(33) *Ceratopteris*

149. *C. thalictroides* (L.) Brongn. —
From tropical to warm-temperate regions of the world

XVIII-IV. **Adianteae**

(34) *Adiantum*

150. *A. fiabellulatum* L. —
S. Japan, Ryukyus, SE. China, Indo-China, India, Ceylon, Malesia

151. "*A. pubescens* Schkuhr" (53) — *A. hispidulum*
Distribution inadequately known

152. *A. myriosorum* Bak. —
Sw. China —

153. *A. soboliferum* Wall. ex Hook. —
S. China (Yunnan, Kwangsi, Hainan), Indo-China, Philippines, Java, India, Comoro Islands, Madagascar, and tropical Africa

154. *A. edgeworthii* Hook. —
Warm-temperate regions of China, Himalaya, Japan, Philippines (Luzon)

155. *A. philippense* L. —
Tropical and subtropical Asia, tropical Africa and Australia

156. *A. capillus-junonis* Rupr. (54) — Not mentioned
China, Japan

157. *A. caudatum* L. —
Tropical and subtropical Asia

158. *A. malesianum* Ghatak (55) — Not mentioned
China, Indo-China, Thailand, Burma, Malesia, Polynesia

159. *A. capillus-veneris* L. —
Tropical, subtropical and warm-temperate regions of the world

160. *A. monochlamys* Eaton —

Japan, S. Korea

161. *A. taiwanianum* Tagawa — *A. roborowskii* var. *taiwanianum*
Endemic

162. *A. formosanum* Tagawa (56) — *A. edentulum*
Endemic

163. *A. diaphanum* Bl. —
Tropical Asia, north to S. China and S. Japan, south to Australia, New Zealand, also in Polynesia

XVIII-V. **Pterideae**

(35) *Pteris* (57*)

164. *P. longipes* Don —
Himalaya, S. India, Ceylon, Burma, Philippines, Java, New Guinea

165. *P. wallichiana* Ag. —
Japan, Ryukyus, S. China (Yunnan, Kweichow, Szechwan), N. India, Burma, Indo-China, Philippines, Indonesia

166. *P. tripartita* Sw. —
Tropics of the Old World

167. *P. formosana* Bak. —
Endemic

168. *P. longipinna* Hayata —
Endemic

169. *P. venusta* Kunze —
Himalaya, Burma, Thailand, Indo-China, Malesia

170. *P. vittata* L. —
Tropics, subtropics and warm-temperate parts of the Old World, naturalized in the warmer parts of America

171. *P. ensiformis* Burm. —
Ryukyus, S. China (Fukien, Kwangtung, Kwangsi, Yunnan, Szechwan), India, Ceylon, Indo-China, Malesia, Australia, east to Polynesia

172. *P. dactylina* Hook. —
E. Himalaya, SW. China (Tibet, Yunnan, Szechwan)

173. *P. deltodon* Bak. —
China (Szechwan, Yunnan, Kweichow, N. Kwangsi, N. Kwangtung), Indo-China, Sumatra

174. *P. nipponica* Shieh —
Japan, Ryukyus

175. *P. nervosa* Thunb. (58) — *P. cretica*
Japan, S. China, Indo-China, E. Himalaya, Philippines

176. *P. pellucidifolia* Hayata (59*) — *P. cretica* var. *laeta*
SW. China (Tibet, Szechwan, Yunnan, Kweichow, Kiangsi), Indo-China, E. Himalaya, Philippines

177. *P. angustipinna* Tagawa —
Endemic

178. *P. multifida* Poir. —
Japan, Ryukyus, S. Korea, China, Indo-China

179. *P. kidoi* Kurata —
Japan

180. *P. cadieri* Christ —
S. Japan, Ryukyus, S. China, Indo-China
181. *P. grevilleana* Wall. ex Ag. —
S. Japan, Ryukyus, S. China, Indo-China, N. India, Malay Peninsula, Philippines, Borneo
182. *P. linearis* Poir. —
Tropical Asia and Africa
183. *P. biaurita* L. —
Pantropical
184. *P. bella* Tagawa —
Endemic
185. *P. scabristipes* Tagawa —
Endemic
186. *P. setuloso-costulata* Hayata —
E. Himalaya, S. Japan, Philippines
187. *P. fauriei* Hieron. —
Japan, Ryukyus, S. China (Chekiang, Fukien, Kwangtung, Anhwei, Hunan, Kiangsi), Indo-China
188. *P. dimidiata* Wilid. (60*) *P. semipinnata*
S. Japan, Ryukyus, SE. China, Indo-China, Malesia, India
189. *P. semipinnata* L. (61*) *P. dispar*
Japan, Ryukyus, SE. China
190. *P. amoena* Bl. (62) *P. tokioi*
S. Japan, China (Tibet), Indo-China, Malaysia, Indonesia
191. *P. excelsa* Gaud. —
Japan, S. Korea, S. China, India, Malesia, Polynesia
(36) *Acrostichum*
192. *A. aureum* L. (63) Not mentioned
Pantropical

XIX. Vittariaceae

(37) *Antrophyum*
193. *A. obovatum* Bak. —
Japan, China (Kwangtung, Kwangsi, Kweichow, Yunnan, Szechwan), Indo-China, N. India
194. *A. parvulum* Blume —
Ryukyus, Malay Peninsula, Philippines, Java
195. *A. formosanum* Hieron. —
Ryukyus, S. China (Kwangtung, Kwangsi, Kweichow, Yunnan)
△196. *A. sessilifolium* (Cav.) Spreng. —
Philippines
(38) *Vittaria*
197. *V. anguste-elongata* Hayata —
Philippines
198. *V. zosterifolia* Willd. —
S. Japan, Ryukyus, S. China (SE. Yunnan, Hainan, Kwangsi), Indo-China, Malesia, Polynesia

199. *V. taeniophylla* Copel. (64) — *V. taeniophylla*, *V. mediosora*
E. Himalaya, Burma, N. Thailand, China (Yunnan), Philippines
200. *V. flexuosa* Fée —
Japan, Ryukyus, S. China (Fukien, Kwangtung, Kwangsi, Kweichow, Yunnan, Szechwan, Hunan, Kiangsi), Indo-China, E. Himalaya, Malesia
(39) *Monogramma*
201. *M. paradoxa* (Fée) Beddome — *Vaginularia paradoxa*
From Ceylon to Polynesia, Taiwan to Australia
202. *M. trichoidea* (Fée) J. Sm. ex Hooker — *V. trichoidea*
Philippines, Borneo, Malay Peninsula

XX. Dennstaedtiaceae

XX-I. Dennstaedtieae

(40) *Microlepia*
203. *M. tenera* Christ —
S. China (Yunnan)
204. *M. hookeriana* (Wall. ex Hook.) Presl —
E. Himalaya, N. Burma, Thailand, Indo-China, S. China, Ryukyus, Malesia
205. *M. marginata* (Panzer) C. Chr. —
Japan, Ryukyus, S. China, E. Himalaya
206. *M. calvescens* (Wall. ex Hook.) Presl —
S. China (Yunnan, Kwangsi), E. Himalaya, Indo-China
207. *M. intramarginalis* (Tagawa) Serizawa (65*)
M. calvescens var. *intramarginalis*, *M. marginata* var. *bipinnata*
Endemic
208. *M. strigosa* (Thunb.) Pr. —
Japan, S. Korea, Ryukyus, to Ceylon, Polynesia
209. *M. substrigosa* Tagawa —
Japan, Ryukyus, E. China (Kiangsi)
210. *M. sinostrigosa* Ching (66) — Not mentioned
Japan, S. China (Szechwan, Yunnan, Kweichow, Kwangsi, Kwangtung, Hunan, Hupeh, Kiangsi)
211. *M. krameri* Kuo (67*) — Not mentioned
Endemic
212. *M. obtusiloba* Hayata —
Japan, Ryukyus, SW. China, Indo-China
213. *M. rhomboidea* (Wall. ex Kunze) Prantl (68*) — *M. taiwaniana*, *M. trapeziformis*
SW. China, E. Himalaya, Indo-China, Ceylon, Malesia
214. *M. speluncae* (L.) Moore —
The Old World tropics and Polynesia
215. *M. platyphylla* (Don) J. Sm. —
SW. China, Himalaya, Indo-China, Ceylon, Philippines
216. *M. trichocarpa* Hayata —
Endemic

217. *M. trichosora* Ching (69) — Not mentioned
S. China (Yunnan)
(41) *Dennstaedtia*
218. *D. scandens* (Blume) Moore —
From Malesia to Polynesia
219. *D. smithii* (Hook.) Moore —
Philippines, Celebes
220. *D. scabra* (Wall. ex Hook.) Moore —
Japan, S. Korea, S. China, Himalaya, Ceylon, Indo-China, Malesia
221. *D. hirsuta* (Sw.) Mett. ex Miq. —
Japan, Korea, NE. to SW. China
(42) *Pteridium*
222. *P. revolutum* (Bl.) Nakai (70) — *P. aquilinum* subsp. *wightianum*
S. China, India, south to Ceylon, Java, New Guinea
223. *P. aquilinum* (L.,) Kuhn var. *latiusculum* (Desv.) Underw. — *P. aquilinum* subsp. *latiusculum*
Tropical to warm-temperate regions of the world
(43) *Paesia*
224. *P. radula* (Bak.) C. Chr. (71*) — *P. taiwanensis*
Malesia
(44) *Hypolepis*
225. *H. punctata* (Thunb.) Mett. —
Pantropical, in Asia north to Japan, S. Korea, S. China and Himalaya
226. *H. tenuifolia* (Forst.) Bernh. (72) — *H. alte-gracillima* *H. tenuifolia*
S. Japan, Ryukyus, SW. China, Malesia, Polynesia
(45) *Histiopteris*
227. *H. incisa* (Thunb.) J. Sm. —
Tropical and subtropical regions of the world

XX-II. Lindsaeeae

(46) *Odontosoria*
228. *O. biflora* (Kaulfuss) C. Chr. — *Sphenomeris biflora*
Japan, Ryukyus, SE. China (Fukien, Kwangtung), Marianas, Philippines (Luzon and Batan Is.)
229. *O. chinensis* (L.) J. Sm. — *Sphenomeris chusana*
Japan, S. Korea, S. China, south to Madagascar and Polynesia
(47) *Lindsaea*
230. *L. merrillii* Copeland ssp. *yaeyamensis* (Tagawa) Kramer — *L. merrillii* var. *yaeyamensis*
Ryukyus
231. *L. lucida* Blume — *L. securifolia* var. *kusukusensis*
Ryukyus, S. China, Himalaya, India, Burma, Thailand, Indo-China, Malesia, Palau Is.
232. *L. heterophylla* Dryander —
Ryukyus, China (Fukien, Kwangtung, Kwangsi, Yunnan), India, Ceylon, Thailand, Indo-China, Malesia, Madagascar, Mascarenes

233. *L. ensifolia* Swartz —
Ryukyus, S. China (Kwangtung, Kwangsi, Yunnan), E. Himalaya, India, Ceylon, Burma, Thailand, Indo-China, Malesia, Australia, Micronesia, Polynesia, Madagascar, Mascarenes, Seychelles, W. and E. Africa
234. *L. chienii* Ching *L. orbiculata* var. *recedens*
Japan, S. China (Kwangtung, Kwangsi, Yunnan), Thailand, Indo-China
235. *L. orbiculata* (Lam.) Mett. ex Kuhn var. *orbiculata* —
Ryukyus, SE. China, India, Ceylon, Thailand, Indo-China, Malesia
236. *L. orbiculata* (Lam.) Mett. ex Kuhn var. *commixta* (Tagawa) Kramer —
S. Japan, Ryukyus, S. China (Hainan, Hongkong, SE. Yunnan), India, Ceylon, Thailand, Indo-China, Malesia
237. *L. javanensis* Blume *L. orbiculata* var. *deltoidea*
Ryukyus, S. China (Kwangtung, Kwangsi), NE. India (Assam), Burma, Thailand, Indo-China, Malesia
238. *L. obtusa* J. Sm. (73) Not mentioned
Andaman Is., Malesia, Australia, Micronesia
239. *L. cultrata* (Willd.) Sw. —
Hainan, S. India, Ceylon, Thailand, Malesia
240. *L. odorata* Roxburgh var. *odorata* —
Japan, S. China, E. Himalaya, S. India, Ceylon, Malesia, Solomon Is.
241. *L. odorata* Roxburgh var. *japonica* (Baker) Kramer *L. japonica*
Japan, Ryukyus, S. Korea, China (Szechwan, Fukien)
(48) *Tapeinidium* (74*)
△242. *T. gracile* (Bl.) v. A. v. R. (75) Not mentioned
Indo-China, Malesia
243. *T. pinnatum* (Cav.) C. Chr. —
Ryukyus, Thailand, S. India, Malesia
△244. *T. biserratum* (Bl.) v. A. v. R. *T. pinnatum* var. *biserratum*
Malesia

XX-III. Monachosoreae

(49) *Monachosorum*
245. *M. henryi* Christ (76) —
Himalaya, Indo-China, S. China (Kwangtung, Kwangsi, Kweichow, Yunnan)
246. *M. maximowiczii* (Bak.) Hayata —
Japan, China (Anhwei, Kiangsi, Hunan, Kweichow, Hupeh)

XXI. Thelypteridaceae

(50) *Thelypteris*
247. *T. griffithii* (Moore) Kuo (77*) *Dictyocline griffithii*
Himalaya, Burma, Indo-China, S. China (Yunnan, Szechwan, Kweichow, Kwangsi)
248. *T. griffithii* (Moore) Kuo var. *wilfordii* (Hook.) Kuo (78*)
D. griffithii var. *wilfordii*
Japan, Ryukyus, SE. China (Chekiang, Fukien, Kwangtung, Kwangsi, Kweichow, Yunnan, Szechwan)
249. *T. dictyoclinoides* (Ching) Kuo (79*) *Stegnogramma dictyoclinoides*

S. China (Yunnan), Annam

250. *T. tottoides* (H. Ito) Kuo (80*) — *Leptogramma tottoides*
China (Chekiang, Fukien)

△251. *T. pozoi* (Lagasca) Morton — *L. pozoi*
Tropics of the Old World to Atlantic Europe

252. *T. phegopteris* (L.) Slosson — *Phegopteris connectilis*
Japan, Korea, China (NE. Shensi, Honan, Szechwan, Kweichow), Himalaya, Siberia, to N. Europe and North America

253. *T. decursive-pinnata* (van Hall) Ching — *P. decursive-pinnata*
Japan, Ryukyus, S. Korea, S. China, Indo-China

254. *T. paludosa* (Bl.) K. Iwats. (81*) — *Pseudophegopteris subaurita*
Ryukyus, Malesia

255. *T. pyrrhorhachis* (Kunze) Kuo (82*) — *P. hirtirachis*
S. China, India, Ceylon, Burma, Indo-China

256. *T. levingei* (Clarke) Ching (83) — Not mentioned
SW. China (Tibet, Yunnan, Szechwan, Shensi) to Kashmir

257. *T. auriculata* (J. Sm.) K. Iwats. — *Cyclogramma auriculata*
S. China, N. India, Philippines (Luzon)

258. *T. leveillei* (Christ) Kuo (84*) — *C. omeiensis*
China (Fukien, Kwangtung, Kweichow, Yunnan, Szechwan), Japan

259. *T. adscendens* Ching — *Metathelypteris adscendens*
S. China (Kwangtung, Kwangsi)

260. *T. gracilescens* (Bl.) Ching — *M. gracilescens*
S. Japan, Himalaya, Malesia

261. *T. uraiensis* (Ros.) Ching — *M. uraiensis*
S. Japan, S. China (Kwangtung, Yunnan), Philippines (Luzon)

262. *T. laxa* (Fr. et Sav.) Ching — *M. laxa*
Japan, Ryukyus, S. Korea, S. China

263. *T. torresiana* (Gaud.) Alston — *Macrothelypteris torresiana*
Mascarene Is., warmer parts of mainland Asia, Japan, Malesia, Queensland, Polynesia, naturalized in the warmer parts of America

264. *T. ornata* (Wall. ex Bedd.) Ching (85) — *M. polypodioides*
S. and NE. India, N. Burma

265. *T. japonica* (Baker) Ching — *Parathelypteris japonica*
Japan, S. Korea, China (Hunan, Kiangsi, Kiangsu, Yunnan)

266. *T. beddomei* (Baker) Ching — *P. beddomei*
Japan, S. Korea, S. India, Ceylon, Malesia

267. *T. glanduligera* (Kunze) Ching — *P. glanduligera*
Japan, Ryukyus, Korea, S. China, Indo-China, E. Himalaya, N. Philippines (Luzon)

268. *T. hirsutipes* (Clarke) Ching (86) — *P. angulariloba*
S. Japan, Ryukyus, S. China, NE. India, Thailand, Malay Peninsula, Sumatra

269. *T. erubescens* (Wall. ex Hook.) Ching — *Glaphyropteridopsis erubescens*
S. Japan, S. China (Yunnan, Szechwan, Kweichow), Himalaya, Indo-China

270. *T. esquirolii* (Christ) Ching — *Pseudocyclosorus esquirolii*
Japan, Ryukyus, S. Korea, S. China, Indo-China

271. *T. tylodes* (Kunze) Ching (87) — Not mentioned
Ceylon, S. India, N. India, Burma, N. Thailand, Vietnam, S. China (Yunnan,

Szechwan, Kwangtung), Philippines (N. Luzon), Timor

272. *T. dentata* (Forsk.) E.P. St. John — *Christella dentata*
Tropics and subtropics of the Old World, naturalized in America

273. *T. parasitica* (L.) K. Iwats. — *C. parasitica*
Tropics and subtropics of Asia, west to Uganda and Kenya, south to Queensland, east to Tahiti and Hawaii

274. *T. jaculosa* (C. Chr.) Panigrahi (88) — *C. subarida*
S. Japan, Ryukyus, S. China, Shan State of Burma

275. *T. latipinna* (Benth.) K. Iwats. (89*) — *C. ensifera*
Ceylon, NE. India (Assam), S. China, south to Malay Peninsula

276. *T. ensifera* (Tagawa) K. Iwats. — *C. acuminata* var. *kuliangensis*
Endemic

277. *T. acuminata* (Houtt.) Morton — *C. acuminata*
Japan, Ryukyus, Korea, S. China, Indo-China, Philippines (Luzon)

278. *T. arida* (Don) Morton — *C. arida*
NW. India to S. China, Thailand, Indo-China, Malesia, Queensland, Polynesia

279. *T. papilio* (Hope) K. Iwats. — *C. papilio*
Ceylon, S. India, NE. India, Thailand, Malay Peninsula

280. *T. taiwanensis* (C. Chr.) K. Iwats — *Sphaerostephanos taiwanensis*
Ryukyus, S. China (Kwangtung, Fukien)

△281. *T. producta* (Kaulf.) Reed (90) — *S. kotoensis*
Philippines

282. *T. truncata* (Poir.) K. Iwats. — *Pneumatopteris truncata*
Ceylon, S. and NE. India, Burma, Indo-China, S. China, Malesia

283. *T. interrupta* (Willd.) K. Iwats. — *Cyclosorus interruptus*
Tropics and subtropics of the world

284. *T. prolifera* (Retz.) Reed — *Ampelopteris prolifera*
Tropical Africa and Asia

285. *T. simplex* (Hook.) K. Iwats. — *Pronephrium simplex*
S. China, Tonkin

286. *T. triphylla* (Sw.) K. Iwats. — *P. triphyllum*
P. triphyllum var. *parishii*
Ceylon, India, Burma, Thailand, S. China, Japan, Malesia, Queensland

287. *T. ramosii* (Christ) Kuo (91*) — *P. cuspidatum*
Ryukyus, Philippines, Moluccas, NE. New Guinea

288. *T. gymnopteridifrons* (Hayata) Kuo (92*) — *P. gymnopteridifrons*
S. China, Philippines (Luzon)

289. *T. longipetiolata* (K. Iwats.) K. Iwats. — *P. longipetiolata*
Endemic

290. *T. insularis* (K. Iwats.) K. Iwats. — *P. insularis*
Ryukyus

XXII. Dryopteridaceae

XXII-I. Peranemeae

(51) *Acrophorus*

291. *A. paleolatus* Pic. Ser. (93) — *A. stipellatus*
S. Japan, SW. China, Indo-China, Himalaya

(52) *Nothoperanema*

292. *N. hendersonii* (Bedd.) Ching — *Dryopteris hendersoni*
N. India, Nepal, S. China, S. Japan, Thailand, N. Philippines (Luzon), Java

293. *N. squamiseta* (Hook.) Ching — *D. squamiseta*
Africa, Madagascar, Himalaya, Yunnan

(53) *Peranema*

294. *P. cyatheoides* Don —
Himalaya, SW. China, Burma

295. *P. aspidioides* (Blume) Mett. (94) — Not mentioned
Ceylon, Nepal, Bhutan, NE. India (Assam), Burma, N. Thailand, Vietnam, S. China, Sumatra, Java, Borneo, New Guinea, Philippines

XXII-II. **Dryopteridеae**

(54) *Hemigramma*

296. *H. decurrens* (Hook.) Copel. —
Ryukyus, S. China (Kwangtung, Yunnan), Indo-China

(55) *Pleocnemia* (95*)

297. *P. rufinervis* (Hayata) Nakai — *P. cumingiana*, in part
Endemic

298. *P. submembranacea* (Hayata) Tagawa et K. Iwats. — *P. cumingiana*, in part
S. China (Yunnan, Kwangsi, Kwangtung, Fukien), Indo-China

(56) *Pteridrys*

299. *P. cnemidaria* (Christ) C. Chr. et Ching —
China (Yunnan), Indo-China, Thailand, Burma, Sikkim

(57) *Ctenitis*

300. *C. apiciflora* (Wall. ex Mett.) Ching —
S. China (Yunnan), E. Himalaya

301. *C. kawakamii* (Hayata) Ching —
Endemic

302. *C. transmorrisonensis* (Hayata) Tagawa —
Endemic

303. *C. maximowicziana* (Miq.) Ching —
Japan, C. China (Hunan, Kiangsi, Kweichow, Szechwan)

304. *C. eatonii* (Bak.) Ching —
Ryukyus. S. China, Philippines (Batan Is.)

305. *C. subglandulosa* (Hance) Ching —
S. Japan, Ryukyus, SW. China (Yunnan, Szechwan, Kweichow, Hupeh, Kwangsi), Indo-China, India, Ceylon, Philippines

(58) *Tectaria* (96)

306. *T. dissecta* (Forst.) Lellinger — *Ctenitopsis dissecta*
Malesia, Polynesia

307. *T. fuscipes* (Wall. ex Bedd.) C. Chr. — *C. fuscipes*
SW. China (Kwangsi, Kweichow, Hainan, Yunnan), Annam, Burma, Himalaya

308. *T. kusukusensis* (Hayata) Kuo (97*) — *C. kusukusensis*
S. China (Hainan), Vietnam

309. *T. devexa* (Kunze ex Mett.) Copel. (98*) —
Ryukyus, S. China (Yunnan, Kwejchow, Kwangsi, Kwangtung), Thailand, Malesia, Ceylon

310. *T. coadunata* (J. Sm.) C. Chr. —
NE. India, Burma, Thailand, SW. China, N. Malay Peninsula
311. *T. brachiata* (Zoll. et Mor.) Morton (99) *T. variolosa*
S. China, NE. India, Thailand, Vietnam, N. Malay Peninsula, Java
312. *T. griffithii* (Bak.) C. Chr. (100) Not mentioned
NE. India (Assam), Burma, Thailand, Vietnam, Malay Peninsula, Sumatra, Borneo, Philippines
313. *T. decurrens* (Presl) Copel. —
Ryukyus, S. China (Fukien, Kwangtung, Kwangsi, Yunnan), Indo-China, Thailand, S. India, Ceylon, Malesia, Polynesia
314. *T. fauriei* Tagawa —
NE. India (Assam), Burma, S. China (Yunnan), N. Thailand, Malay Peninsula (Pahang), Ryukyus
315. *T. simonsii* (Bedd.) Ching (101) *T. kwarenkoensis*
T. subtriphylla var. *ebenosa*
NE. India (Assam), S. China, Thailand, Vietnam, Malay Peninsula, Ryukyus
316. *T. linlaoensis* Ching (102) Not mentioned
S. China (Hainan)
317. *T. subtriphylla* (Hook. et Arn.) Cop. —
Ryukyus, S. China (Fukien, Kwangtung, Kwangsi), Indo-China
318. *T. polymorpha* (Wall. ex Hook.) Copel. (103) *T. trifolia*
S. China, Nepal, Sikkim, Bhutan, NE. India (Assam), S. India, Ceylon, Burma, Thailand, Indo-China, Java, Sumatra, Philippines
319. *T. phaeocaulis* (Rosenst.) C. Chr. —
Ryukyus, S. China (Fukien, Kwangtung, Kwangsi), Indo-China
320. *T. yunnanensis* (Bak.) Ching —
S. China, Vietnam
321. *T. zeilanica* (Houtt.) Sledge *Quercifilix zeylanica*
Ceylon, S. India, S. China (Yunnan, Kweichow, Kwangsi, Kwangtung), Thailand, Indo-China

(59) *Lastreopsis*

322. *L. tenera* (R. Br.) Tindale —
Philippines, S. India, Ceylon, Sumatra, Bali, Queensland, New Caledonia, Fiji

(60) *Arachniodes*

323. *A. globisora* (Hayata) Ching —
Endemic
324. *A. festina* (Hance) Ching —
China (Kwangtung, Fukien, Kwangsi, Kweichow)
325. *A. nigrospinosa* (Ching) Ching —
S. China (Kwangtung, Kweichow)
326. *A. aristata* (Forst.) Tindale —
Tropics and subtropics in Asia, north to S. China, Korea, Japan
327. *A. amabilis* (Bl.) Tindale (104) *A. rhomboides* var. *yakusimensis*
Tropical Asia, north to S. China and Japan
328. *A. rhomboidea* (Wall. ex Mett.) Ching (105*) —
Japan, S. China, India, Nepal, Burma
329. *A. tripinnata* (Goldm.) Sledge (106) *A. pseudo-aristata*
Japan, Ryukyus, Java, Borneo, Philippines, S. India, Ceylon

(61) *Dryopteris*

330. *D. diffracta* (Bak.) C. Chr. — *Acrorumohra diffracta*
S. China (Yunnan, Kwangsi, Hainan), Indo-China

331. *D. subreflexipinna* Ogata — *A. subreflexipinna*
Endemic

332. *D. hasseltii* (Blume) C. Chr. — *A. hasseltii*
S. Japan, Ryukyus, S. China (Hainan), Tonkin, E. Himalaya, Malesia

333. *D. quadripinnata* (Hayata) Hayata — *Leptorumohra quadripinnata*
S. China (Yunnan, Kwangsi)

334. *D. enneaphylla* (Bak.) C. Chr. — —
China (Hupeh)

335. *D. enneaphylla* (Bak.) C. Chr. var. *pseudosieboldii* (Hayata) Tagawa et K. Iwats. — —
Endemic

336. *D. toyamae* Tagawa (107) — Not mentioned
Japan

337. *D. cycadina* (Fr. et Sav.) C. Chr. (108) — *D. atraia*
Japan, Korea, S. China, Burma, India, Nepal

338. *D. stenolepis* (Bak.) C. Chr. (109) — *D. atrata*
SW. China (Yunnan, Kweichow, Szechwan), Indo-China

339. *D. namegatae* (Kurata) Kurata (110*) — Not mentioned
Japan, China

340. *D. subatrata* Tagawa — —
Endemic

341. *D. scottii* (Bedd.) Ching — —
S. China, Indo-China, Burma, Himalaya

342. *D. wallichiana* (Spr.) Alston et Bonner — —
Tropical regions of the world, in Asia north to India, Nepal, Burma, W. China (Tibet, Yunnan) and Japan

343. *D. sinofibrillosa* Ching (111) — *D. fibrillosa*
W. China (Tibet, Yunnan, Szechwan), N. India, Pakistan

344. *D. lepidopoda* Hayata (112*) — —
W. China (Tibet, Yunnan, Szechwan), Himalaya

345. *D. expansa* (Presl) Fraser-Jenkins et Jermy (113) — *D. austriaca*
North America, Europe, Siberia, China, Japan, Korea

346. *D. bonatiana* (Brause) Fraser-Jenkins (114*) — Not mentioned
China (Yunnan)

347. *D. chrysocoma* (Christ) C. Chr. (115) — Not mentioned
W. China (Tibet, Yunnan), N. India, Pakistan, Burma, Philippines (Luzon)

348. *D. costalisora* Tagawa — —
Himalaya

349. *D. acute-dentata* Ching (116*) — *D. serrata-dentata*
W. China (Tibet), Sikkim

350. *D. alpestris* Tagawa (117) — Not mentioned
W. China (Tibet), Nepal

351. *D. subbarbigera* Ching (118*) — *D. barbigera*
W. China (Tibet, Chinghai, Yunnan)

352. *D. lacera* (Thunb.) O. Ktze. (119) — Not mentioned

Japan, Korea

353. *D. sublacera* Christ (120) — Not mentioned
W. China (Tibet, Szechwan, Yunnan, Hupeh)

354. *D. fructuosa* (Christ) C. Chr. (121*) — *D. hypophlebia*, in part
W. China (Yunnan, Szechwan, Tibet), Sikkim

355. *D. lachoongensis* (Bedd.) Nayar (122) — *D. hypophlebia*, in part
Sikkim

356. *D. reflexosquamata* Hayata — —
Himalaya

357. *D. marginata* (Wall. ex Christ) Christ (123) — Not mentioned
China, Himalaya, India, Ceylon, Malay Peninsula

358. *D. polita* Rosenst. — —
S. Japan, Indo-China, Thailand, Malay Peninsula, Sumatra, Borneo, Mindanao, Papua New Guinea

359. *D. subexaltata* (Christ) C. Chr. — —
S. Japan, Ryukyus

360. *D. sparsa* (Don) O. Ktze. — —
Tropical Asia, north to S. China and S. Japan

361. *D. yoroi* Serizawa (124) — Not mentioned
Endemic

362. *D. varia* (L.) O. Ktze. — —
Japan, Korea, Ryukyus, S. China, N. and E. India, Philippines

363. *D. sordidipes* Tagawa — —
Japan, Ryukyus

364. *D. subintegriloba* Serizawa (125) — Not mentioned
Endemic

365. *D. formosana* (Christ) C. Chr. — —
Japan, Philippines (Luzon)

366. *D. uropinna* Price (126) — *D. labordei*
S. Japan, Ryukyus, S. China (Kwangsi, Yunnan), Indo-China, Thailand, NE. India (Assam), Philippines

367. *D. tenuipes* (Rosenst.) Serizawa (127) — Not mentioned
Endemic

(62) *Cyrtomium*

368. *C. hookerianum* (Presl) C. Chr. — —
Japan, SW. China (Yunnan, Szechwan, Kweichow, Kwangsi), Indo-China, N. India, Nepal

369. *C. falcatum* (L. f.) Presl — —
Japan, Ryukyus, S. Korea, E. and SE. China, Indo-China

370. *C. devexicapulae* (Koidz.) Koidz. ex Ching (128) — Not mentioned
Japan, Korea, S. China (Fukien, Kwangtung, Kwangsi, Kweichow, Hunan, Kiangsi), N. Vietnam

371. *C. macrophyllum* (Makino) Tagawa var. *acuminatum* (Diels) Tagawa — —
C. China

372. *C. taiwanense* Tagawa — —
Endemic

373. *C. caryotideum* (Wall. ex Hook. et Grev.) Presl — —
Japan, China (Tibet, Yunnan, Kweichow, Szechwan, Kwangtung, Hupeh,

Kansu, Shensi), Indo-China, Burma, India, Nepal

374. *C. fraxinellum* (Christ) Christ — *Cyrtogonellum fraxinellum*
SW. China (Yunnan, Kwangsi, Kweichow, Szechwan), Indo-China

(63) *Polystichum*

375. *P. acutidens* Christ —
China (Yunnan, Kweichow, Szechwan, Kwangsi, Hunan, Hupeh), Indo-China

376. *P. hecatopteron* Diels —
China (Yunnan, Kwangsi, Kweichow, Szechwan, Hupeh, Hunan)

377. *P. hancockii* (Hance) Diels —
S. China (Fukien, Kwangtung, Kwangsi), Japan, Ryukyus

378. *P. formosanum* Rosenst. —
Ryukyus

379. *P. obliquum* (Don) Moore —
N. India, W. China, Nepal, Philippines

380. *P. deltodon* (Bak.) Diels —
Japan, China (Yunnan, Szechwan, Kweichow, Hupeh, Anhwei, Kwangtung), Indo-China

381. *P. stenophyllum* Christ —
Nepal, N. India, W. China (Tibet, Kansu, Hupeh, Szechwan, Yunnan)

382. *P. morii* Hayata —
Endemic

383. *P. lepidocaulon* (Hook.) J. Sm. —
Japan, Korea, E. and C. China

384. *P. nepalense* (Spreng.) C. Chr. —
W. China (Yunnan, Szechwan, Tibet), N. India, Nepal, Philippines

385. *P. manmeiense* (Christ) Nakaike (129) — *P. falcatipinnum*
Nepal, India, SW. China

386. *P. prionolepis* Hayata —
Endemic

387. *P. xiphophyllum* (Bak.) Diels —
W. China

388. *P. duthiei* (Hope) C. Chr. —
NW. India, W. China

389. *P. thomsonii* (Hook.) Bedd. —
Nepal, NE. India, Pakistan, W. China (Tibet, Yunnan, Szechwan, Kansu)

390. *P. lachenense* (Hook.) Bedd. —
Japan, W. China (Tibet, Yunnan, Szechwan), Sikkim, Bhutan, Nepal, Kashmir

391. *P. prescottianum* (Wall. ex Mett.) Moore —
China (Tibet), Nepal, Sikkim, Bhutan, NW. India, Pakistan, Afghanistan

392. *P. acanthophyllum* (Franch.) Christ (130) — *P. ilicifolium*
W. China (Tibet, Yunnan, Szechwan), N. India., Nepal

393. *P. biaristatum* (Bl.) Moore —
Ceylon, Nepal, NE. India (Assam), Burma, Thailand, Vietnam, SW. China, Java

394. *P. tacticopterum* (Kunze) T. Moore (131*) — *P. kodamae*
Nepal, Bhutan, Sikkim, NE. India (Khasia), S. India, Ceylon

395. *P. tsussimense* (Hook.) J. Sm. —
Japan, S. Korea, S. China, Indo-China

396. *P. parvipinnulum* Tagawa —
Endemic
397. *P. nigro-paleaceum* (Christ) Diels (132) *P. piceopaleaceum*
Japan, Nepal, SW. China, N. India
398. *P. neolobatum* Nakai —
Japan, China (Yunnan, Szechwan, Shensi, Kansu, Chekiang), Nepal, Bhutan, India
399. *P. kiusiuense* Tagawa —
Japan
400. *P. eximium* (Mett. ex Kuhn) C. Chr. —
Ceylon, S. China, Vietnam, Japan
401. *P. wilsonii* Christ —
N. India

XXII-III. **Physematieae**

(64) *Diplazium*
402. *D. subsinuatum* (Wall. ex Hook. et Grev.) Tagawa —
Japan, Ryukyus, Korea, S. China, from Nepal to NE. India (Assam), Ceylon, Indo-China, Philippines (Luzon)
403. *D. donianum* (Mett.) Tard.-Blot —
Japan, Ryukyus, S. China, Indo-China, Thailand, Malay Peninsula, India
404. *D. lobatum* (Tagawa) Tagawa —
S. Japan, Ryukyus, S. China
405. *D. wichurae* (Mett.) Diels —
Japan, Ryukyus, S. Korea, China
406. *D. megaphyllum* (Bak.) Christ —
S. China, Indo-China, Thailand, Burma
407. *D. fauriei* Christ (133) *D. mettenianum*
Japan, Ryukyus, S. China, Philippines, Indo-China, Thailand
408. *D. latifrons* v. A. v. R. (134) *D. petri*
Japan, Ryukyus, S. China, Indo-China, Thailand, Philippines (Luzon)
409. *D. uraiense* Rosenst. (135*) *D. dilatatum*
Japan, Ryukyus, S. China, Indo-China
410. *D. virescens* Kunze —
Japan, Ryukyus, S. China, Indo-China
411. *D. virescens* Kunze var. *okinawaense* (Tagawa) Kurata (136*) *D. virescens*
Japan, Ryukyus, China (Hong Kong)
412. *D. taiwanense* Tagawa (137) Not mentioned
S. Japan, Ryukyus, Indo-China, Thailand
413. *D. incomptum* Tagawa —
Ryukyus, Thailand
414. *D. muricatum* (Mett.) v. A. v. R. (138*) *D. kawakamii*
Ceylon, S. India, Nepal, Sikkim, Bhutan, Khasi and Naga Hills in NE. India, Burma, Siam, Java, S. Japan
415. *D. doederleinii* (Luerss.) Makino —
Japan, Ryukyus, S. China, Philippines

416. *D. pseudo-doederleinii* Hayata (139*) — *D. pseudo-doederleinii* *D. phaeolepis*
Endemic

417. *D. polypodioides* Bl. (140) — Not mentioned
Malesia, S. India, Ceylon

418. *D. amamianum* Tagawa (141*) — Not mentioned
Ryukyus

419. *D. chinense* (Bak.) C. Chr. (142) — Not mentioned
Japan, Ryukyus, S. Korea, China (Chekiang, Kiangsu, Kiangsi, Szechwan, Kweichow, Kwangsi)

420. *D. squamigerum* (Mett.) Matsum. —
Japan, S. China, N. India

421. *D. esculentum* (Retz.) Sw. — *Anisogonium esculentum*
Tropics and subtropics of Asia

422. *D. formosanum* Rosenst. — *Dictyodroma formosana*
S. China, Indo-China

423. *D. javanicum* (Bl.) Makino — *Diplaziopsis javanica*
Ceylon, Nepal to NE. India (Assam), S. and E. China, Indo-China, Malesia, New Caledomia, Samoa, Fiji, Tahiti

424. *D. pullingeri* (Bak.) J. Sm. — *Monomelangium pullingeri*
Ryukyus, S. China, Vietnam

(65) *Athyrium*

425. *A. atkinsonii* Bedd. — *Pseudocystopteris atkinsoni*
Japan, SW. China (also in Tibet, Chinling, Honan), Bhutan, Nepal, Sikkim, Burma

426. *A. arisanense* (Hayata) Tagawa —
Japan, SE. China

427. *A. epirachis* (Christ) Ching (143*) — Not mentioned
SW. China

428. *A. delavayi* Christ (144*) — *Athyrium subrigescens*
SW. China (Yunnan, Szechwan, Kweichow, Kwangsi), Philippines

429. *A. otophorum* (Miq.) Koidz. (145*) — *A. kuratae*
Japan, E. and C. China

430. *A. reflexipinnum* Hayata —
S. Japan, Philippines (Luzon)

431. *A. oppositipennum* Hayata —
Endemic

432. *A. vidalii* (Fr. et Sav.) Nakai (146*) —
Japan, Korea, C. and W. China, Nepal, N. India, N. Vietnam, N. Burma

433. *A. foliolosum* Sim (147*) — *A. erythropodum*, in most part *A. goeringianum*
Himalaya to S. China (Yunnan)

434. *A. erythropodum* Hayata (148*) —
S. Japan

435. *A. niponicum* (Mett.) Hance —
Japan, Korea, China

436. *A. drepanopterum* (Kunze) Milde —
SW. China, Himalaya, Burma, India, Philippines

437. *A. nigripes* (Bl.) Moore (149) Japan, India, Ceylon, Java	*A. tozanense*
438. *A. silvicolum* Tagawa S. Japan, N. India	—
439. *A. strigillosum* (Lowe) Salomon (150) Japan (Yakushima), China, N. India	Not mentioned
440. *A. iseanum* Rosenst. Japan, Korea, S. China	—
441. *A. crytogrammoides* Hayata Endemic	—
442. *A. nakanoi* Makino Japan, SW. China (Tibet, Yunnan)	—
443. *A. anisopterum* Christ SW. China (also in Tibet), Burma, India, Nepal	—
444. *A. fragile* Tard.-Blot Vietnam	—
(66) *Cystopteris*	
445. *C. fragilis* (L.) Bernh. Temperate regions of Europe, Asia and North America	—
446. *C. moupinensis* Franch. Japan, C. and W. China, N. India	—
(67) *Acystopteris*	
447. *A. japonica* (Luerssen) Nakai Japan, C. China (Fukien, Szechwan, Kweichow)	*Cystopteris japonica*
448. *A. tenuisecta* (Bl.) Tagawa SW. China (Tibet, Yunnan), India, Burma, Indo-China, Malesia Japan	*C. tenuisecta*
(68) *Gymnocarpium*	
449. *G. oyamense* (Bak.) Ching Japan, C. and W. China, Nepal, Philippines	—
450. *G. remote-pinnatum* (Hayata) Ching Endemic	—
(69) *Woodsia*	
451. *W. polystichoides* Eat. S. and E. Siberia, Japan, Korea, N. and C. China	—
452. *W. okamotoi* Tagawa (151) Endemic	Not mentioned
(70) *Deparia*	
453. *D. subfluviatis* (Hayata) M. Kato (152) S. to SW. China, Thailand, Philippines (Luzon), Himalaya (?)	*Dryoathyrium boryanum*
454. *D. unifurcata* (Baker) M. Kato Japan, SW. China (Szechwan, Kweichow, Yunnan)	*D. unifurcatum*
455. *D. petersenii* (Kunze) M. Kato (153) Tropical and subtropical Asia	*Athyriopsis japonica*
456. *D. allantodioides* (Bedd.) M. Kato (154) Himalaya, Burma, SW. China, New Guinea	*Lunathyrium pycnosorum*
(71) *Cornopteris*	
457. *C. decurrenti-alata* (Hook.) Nakai Japan, S. Korea, C. and S. China	—

458. *C. opaca* (Don) Tagawa (155) Not mentioned
Japan, SW. China, Burma, N. Thailand, Indo-China, Himalaya, Malesia
459. *C. banajaoensis* (C. Chr.) K. Iwats. et Price (156) *C. fluvialis*
S. Japan, SW. China, Sikkim, Philippines, Papua New Guinea
460. *C. philippinensis* M. Kato (157) Not mentioned
Philippines
(72) *Hypodematium*
461. *H. crenatum* (Forsk.) Kuhn —
From Arabia eastwards right across China to Japan, southwards to southern and eastern Africa, and through Malesia to the Pacific

XXII-IV. **Onocleeae**

(73) *Matteuccia*
462. *M. orientalis* (Hook.) Trev. —
Japan, Korea, China, Himalaya

XXII-V. **Oleandreae**

(74) *Arthropteris*
463. *A. palisotii* (Desv.) Alston —
China, Indo-China, Malesia, Polynesia, India, Africa
(75) *Oleandra*
464. *O. wallichii* (Hook.) Presl —
SW. China, N. Burma, Vietnam, N. India, Nepal

XXII-VI. **Bolbitideae**

(76) *Bolbitis*
465. *B. appendiculata* (Willd.) Iwatsuki *Egenolfia appendiculata* *E. laxireticulata*
Tropical Asia, north to S. China (Kwangtung, Kwangsi, Yunnan) and Ryukyus
466. *B. rhizophylla* (Kaulf.) Hennipman *E. rhizophylla*
Philippines
467. *B. heteroclita* (Presl) Ching —
Tropical Asia, north to S. China (Yunnan, Kweichow, Szechwan, Kwangsi, Kwangtung)
468. *B. angustipinna* (Hayata) Ito (158) *B. contaminans*
China (Yunnan), Thailand, Burma, Nepal, Bhutan, Sikkim, India, Ceylon
469. *B. subcordata* (Copel.) Ching —
S. China (Kwangsi, Kwangtung, Fukien, Kiangsi)
470. *B. scalpturata* (Fée) Ching (159) Not mentioned
Malesia, Indo-China, Thailand, Burma
(77) *Lomariopsis*
471. *L. spectabilis* (Kze.) Mett. —
Malesia, Ryukyus
(78) *Elaphoglossum* (160*)
472. *E. angulatum* (Bl.) Moore —
E. tropical Africa, Madagascar, Réunion, Ceylon, S. India, Vietnam, Malesia, New Hebrides

473. *E. yoshinagae* (Yatabe) Makino —
Japan, S. China (Fukien, Kwangtung, Kwangsi, Kweichow, Kiangsi)
474. *E. luzonicum* Copel. (161) *E. lepidopodum*
Philippines, E. New Guinea
475. *E. marginatum* (Wall. ex Fée) T. Moore (162) *E. conforme*
E. pendulifolium
Himalaya, China (Yunnan)
476. *E. callifolium* (Bl.) Moore —
S. Vietnam, throughout Malesia, east to Samoa
477. *E. commutatum* (Mett. ex Kuhn) v. A. v. R. (163*) Not mentioned
Ceylon, S. India, Sumatra, W. Java, Borneo, New Gninea

XXIII. **Aspleniaceae**

(79) *Asplenium*
478. *A. nidus* L. —
Tropical and subtropical Old World, in Asia north to S. China (Kwangtung, Kwangsi, Yunnan) and S. Japan
479. *A. antiquum* Makino —
Japan, S. Korea, Ryukyus
480. *A. ensiforme* Wall. ex Hook. et Grev. —
Japan, SW. China (Kwangsi, Szechwan, Kweichow, Yunnan, Tibet), Burma, Thailand, Vietnam, Nepal, India, Ceylon
481. *A. griffithianum* Hook. —
S. Japan, S. and SW. China, Vietnam, N. India, Nepal
482. *A. septentrionale* (L.) Hoffm. —
North America (also in Mexico), Europe, NW. Africa, W. Asia, to Altai, Himalaya, Pakistan and N. China
483. *A. ruta-muraria* L. —
Temperate regions of the N. hemisphere
484. *A. formosae* Christ —
Ryukyus, S. China, Indo-China
485. *A. polyodon* Forst. (164) *A. adiantoides*
Madagascar through Malesia to Australia and Polynesia, north to NE. India (Assam)
△486. *A. serricula* Fée (165*) *A. vulcanicum*
Ceylon, S. India, Philippines
487. *A. normale* Don —
E. Africa, Polynesia, tropical Asia, north to S. China (also in Tibet), S. Korea, Japan
488. *A. trichomanes* L. —
Warm-temperates and temperate regions and locally in the tropics of the whole world
489. *A. tripteropus* Nakai *A. anceps* var. *proliferum*
Japan, S. China
490. *A. viride* Huds. —
North America, Europe, Siberia, Sakhalien, Japan, W. China (Tibet, Hsingkiang)

491. *A. incisum* Thunb. —
Kamchatka, Sakhalien, Japan, Ryukyus, Korea, E. and S. China
492. *A. yunnanense* Franch. (166) Not mentioned
W. China (Tibet, Chinghai, Szechwan, Kweichow, Yunnan)
493. *A. wrightii* Eat. ex Hook. —
Japan, Ryukyus, S. China (Fukien, Kwangtung, Kwangsi, Kweichow, Yunnan), Vietnam
494. *A. tenerum* Forst. —
Seychelles, Ceylon, S. India, Burma, Thailand, Indo-China, Malay Peninsula, Java, Borneo, Philippines, New Guinea, Polynesia
495. *A. shikokianum* Makino (167) Not mentioned
Japan, S. China
496. *A. pulcherrimum* (Bak.) Ching —
SW. China, Tonkin
497. *A. adiantum-nigrum* L. —
Europe, Africa, temperate Asia
498. *A. wilfordii* Mett. ex Kuhn —
Japan, Ryukyus, S. Korea, China
499. *A. neolaserpitiifolium* Tardieu et Ching (168*) *A. cuneatum*
Ryukyus, S. China, Indo-China
500. *A. yoshinagae* Makino (169) *A. planicaule*
S. China (also in Tibet), Nepal, N. and S. India, Ceylon, Burma, Thailand, Vietnam, Philippines
501. *A. prolongatum* Hook. —
Japan, S. Korea, S. China, Indo-China, India, Ceylon
502. *A. cuneatiforme* Christ —
Endemic
503. *A. gueinzianum* Mett. ex Kuhn (170) *A. laciniatum*
China (Yunnan), Nepal, N. India, Burma, S. Africa
504. *A. capillipes* Makino —
Japan, Himalaya
505. *A. tenuicaule* Hayata (171*) *A. varians*
Japan, Korea, NE., and NW. China (also in Tibet)
506. *A. pekinense* Hance (172) Not mentioned
E. Siberia, Japan, Korea, S., N. and NE. China
507. *A. bullatum* Wall. ex Mett. —
S. China, N. India, Tonkin
508. *A. ritoense* Hayata —
Ryukyus, S. Korea, S. China
509. *A. tenuifolium* Don —
China, Burma, N. India, Indo-China, S. India, Ceylon, Malay Peninsula, Philippines
510. *A. cheilosorum* Kze. ex Mett. —
Tropical Asia, north to S. China and Japan
511. *A. obscurum* Bl. —
Malawi, Madagascar, Ceylon, S. and N. India, S. China, Burma, Thailand, Indo-China, Java

512. *A. excisum* Presl —
Tropical Asia, north to S. China (Kwangtung, Kwangsi, Yunnan, also in Tibet)
513. *A. unilaterale* Lam.
E. Africa, tropical Asia, north to S. China and Japan

XXIV. **Davalliaceae**

(80) *Araiostegia*
514. *A. parvipinnula* (Hayata) Copel. (173) *A. perdurans*
Endemic
(81) *Leucostegia*
515. *L. immersa* Presl (174) —
S. China (Kwangsi, Yunnan), Vietnam, Thailand, Burma, Nepal, Malesia
(82) *Davallia*
516. *D. formosana* Hayata (175) *D. divaricata*
S. China (Kwangtung, Kwangsi, Yunnan), Indo-China
517. *D. mariesii* Moore ex Bak. —
S. Korea, Japan, Ryukyus, E. China (Liaoning, Shantung, Kiangsu)
518. *D. solida* (Forst.) Sw. —
Burma, Malesia, Polynesia
(83) *Humata*
519. *H. griffithiana* (Hook.) C. Chr. *Davallia griffithiana*
N. India, S. China
520. *H. trifoliata* Cav.
Ryukyus, Hongkong, Philippines, Bonin Is., Indonesia, Mariana Is.
521. *H. obtusata* v. A. v. R. (176) *H. chrysanthemifolia*
Philippines
522. *H. vestita* (Bl.) Moor —
Malesia
523. *H. repens* (L. f.) Diels —
N. India, S. China, Iapan, Burma, Thailand, Vietnam, Malay Peninsula, Philippines, Borneo, Java, Australia, Polynesia, Madagascar
△524. *H. pectinata* (J. Sm.) Desv. —
Malesia, Micronesia
(84) *Nephrolepis*
525. *N. multiflora* (Roxburgh) Jarrett ex Morton (177*) *N. hirsutula*
Ryukyus, Indo-China, India, Philippines
526. *N. auriculata* (L.) Trimen —
Tropical and subtropical regions of the world, in Asia north to S. and E. China and Japan
527. *N. biserrata* (Sw.) Schott —
Pantropical

XXV. **Blechnaceae**

(85) *Woodwardia*
528. *W. harlandii* Hook. —
Ryukyus, S. China, Indo-China

529. *W. kempii* Copel.
Japan, Ryukyus, S. China
530. *W. unigemmata* (Makino) Nakai —
Japan, C., W. and SW. China, Philippines
531. *W. japonica* (L. f.) Sm. —
Japan, Korea, S. China, Indo-China
532. *W. prolifera* Hook. et Arn. (178) *W. orientalis*
S. Japan, Ryukyus, SE. China
(86) *Blechnum*
533. *B. melanopus* Hook. —
India, W. China
534. *B. orientale* L.
Tropical and subtropical Asia, Australia, Pacific Islands, north to S. China, S. Japan
535. *B. eburneum* Christ —
C. China (Szechwan, Kweichow, Kwangsi, Hunan)
536. *B. hancockii* Hance —
Endemic
537. *B. insigne* (Hook.) Kuo (179*) *Brainea insignis*
S. China (Kwangtung, Kwangsi, Kweichow, Yunnan), Indo-China
538. *B. fraseri* (A. Cunn.) Luerssen *Diploblechnum fraseri*
Philippines, Sumatra, Borneo, New Guinea, New Zealand

XXVI. **Polypodiaceae**

XXVI-I. **Drynarieae**

(87) *Drynaria*
539. *D. fortunei* (Kze.) J. Sm. —
S. China, Indo-China
(88) *Aglaomorpha*
540. *A. coronans* (Wall. ex Hook.) Copel. —
Ryukyus, S. China (Kwangtung, Kwangsi, Yunnan), Indo-China, Burma, India, Nepal, Malay Peninsula
541. *A. meyeniana* Schott —
Philippines

XXVI-II. **Polypodieae**

(89) *Belvisia*
542. *B. mucronata* (Fée) Copel. —
Ceylon, Malesia, Micronesia, Polynesia
(90) *Lemmaphyllum*
543. *L. rostratum* (Bedd.) Tagawa *Lepidogrammitis rostrata*
S. China (Kwangtung, Kwangsi, Kweichow, Yunnan, Tibet), Indo-China, Burma, N. India, Thailand
544. *L. microphyllum* Presl —
Japan, Ryukyus, S. Korea, S. China
(91) *Leptochilus*

545. *L. decurrens* Bl.
Tropical Asia, north to S. China (Kwangtung, Yunnan, Kweichow)

(92) *Lepisorus* (180*)

546. *L. kuchenensis* (Wu) Ching (181) — Not mentioned
S. China

547. *L. clathratus* (Clarke) Ching — —
Siberia, Japan, W. China, N. India, Nepal, Afghanistan

548. *L. pseudo-ussuriensis* Tagawa — —
Endemic

549. *L. kawakamii* (Hayata) Tagawa (182) — *L. megasorus* in part
Endemic

550. *L. megasorus* (C. Chr.) Ching — *L. megasorus* in part
Endemic

551. *L. morrisonensis* (Hayata) H. Ito — —
SW. and W. China, Sikkim

552. *L. monilisorus* (Hayata) Tagawa (183) — *L. thunbergianus*
Endemic

553. *L. obscure-venulosus* (Hayata) Ching — —
S. China

554. *L. suboligolepidus* Ching (184) — Not mentioned
S. China

555. *L. tosaensis* (Makino) H. Ito — —
E., S. and SW. China, Japan

556. *L. thunbergianus* (Kaulf.) Ching — —
Japan, Ryukyus, Korea, E., S. and SW. China, Philippines

(93) *Neocheiropteris*

557. *N. ensata* (Thunb.) Ching — —
Japan, Ryukyus, S. Korea, SW. China, Indo-China

(94) *Drymotaenium*

558. *D. miyoshianum* (Makino) Makino — —
Japan, S. China

(95) *Arthromeris*

559. *A. lehmannii* (Mett.) Ching — —
S. and SW. China, Nepal, N. India, Burma, Thailand

(96) *Crypsinus*

560. *C. echinosporus* (Tagawa) Tagawa — —
Endemic

561. *C. quasidivaricatus* (Hayata) Copel. (185*) — *C. quasidivaricatus*
C. veitchii
W. China (Yunnan, Szechwan, Hupeh, Tibet), N. India, Nepal

△562. *C. taeniatus* (Sw..) Copel. var. *palmatus* (Bl.) Tagawa — —
Malesia, Polynesia

563. *C. hastatus* (Thunb.) Copel. — —
Japan, Ryukyus, S. Korea, S. China

564. *C. taiwanensis* (Tagawa) Tagawa — —
Endemic

565. *C. yakushimensis* (Makino) Tagawa — —
Korea, Japan, Ryukyus

566. *C. okamotoi* (Tagawa) Tagawa —
Endemic
567. *C. engleri* (Luerss.) Copel. —
Japan, S. Korea
568. "*Microsorium rubidum* (Kunze) Copel." (186) *Phymatodes longissima*
Ryukyus, China, Indo-China, Thailand, India, Malesia, Micronesia
569. "*Microsorium scolopendrium* (Burm.) Copel." *P. scolopendria*
From Africa to Pacific Islands, north to S. China (Hainan, Yunnan) and Ryukyus

(97) *Microsorium*

570. *M. henryi* (Christ) Kuo (187*) *M. fortunei*
Ryukyus, S. China, Indo-China, Burma, Bhutan
571. *M. membranaceum* (Don) Ching —
S. and SW. China, Indo-China, Thailand, India, Ceylon, Philippines
572. *M. pteropus* (Bl.) Copel. —
Ryukyus, S. China (Kwangtung, Kwangsi, Kweichow, Yunnan), India, Ceylon, Indo-China, Malesia
573. *M. dilatatum* (Beddome) Sledge —
S. Japan, Ryukyus, S. China (Kwangtung, Kwangsi, Kweichow, Yunnan, Szechwan, Tibet), India, Indo-China, Ceylon, Malesia
574. *M. brachylepis* (Baker) Nakaike (188) *M. buergerianum*
Japan, Ryukyus, S. China, Indo-China
575. *M. punctatum* (L.) Copel. (189) *M. punctatum*
M. steerei
Africa, tropical Asia, north to S. China (Kwangtung, Kwangsi, Yunnan, Kweichow)

(98) *Colysis* (190)

576. *C. pothifolia* (Don) Presl (191*) *C. elliptica*
Japan, Ryukyus, S. China, Indo-China, Burma, India, Nepal, Philippines
577. *C. hemionitidea* (Wall. ex Mett.) Presl —
Japan, Ryukyus, S. China (Fukien, Kwangtung, Kwangsi, Yunnan, Kweichow, Tibet), Indo-China, Burma, N. India, Nepal, Philippines
578. *C. wrightii* (Hook.) Ching —
Japan, Ryukyus, S. China (Kiangsi, Kwangtung, Fukien), Indo-China

(99) *Polypodium*

579. *P. argutum* Wall. ex Hook. *Goniophlebium argutum*
SW. China, Indo-China, Thailand, N. Burma, Nepal, N. India, Philippines
580. *P. transpianense* Yamam. —
Endemic
581. *P. amoenum* Wall. ex Mett. —
SW. China (Yunnan, Szechwan, Tibet), N. Burma, N. Thailand, Nepal, N. India
582. *P. microrhizoma* Clarke ex Baker (192*) *P. atkinsoni*
SW. China (Yunnan, Szechwan, Tibet), Nepal, N. India
583. *P. formosanum* Bak. (193*) *P. formosanum*
P. raishanense
S. Japan, S. China

(100) *Pyrrosia*

584. *P. angustissima* (Giesenh. ex Diels) Kuo (194*) *Saxiglossum angustissimum*
Japan, S. China

585. *P. polydactyla* (Hance) Ching —
Endemic
586. *P. adnascens* (Sw.) Ching —
Tropical Asia, north to S. China (Kwangtung, Kwangsi, Yunnan) and Ryukyus
587. *P. linearifolia* (Hook.) Ching —
Japan, Korea, China (Liaoning, Fukien), Ryukyus
588. *P. sheareri* (Bak.) Ching —
S. China, Indo-China
589. *P. lingua* (Thunb.) Farw. —
Japan, Ryukyus, S. Korea, S. China, Indo-China
590. *P. transmorrisonensis* (Hayata) Ching (195) *P. mollis*
Endemic
591. *P. gralla* (Giesenh.) Ching (196) Not mentioned
China (Hupeh, Szechwan, Yunnan)
592. *P. matsudae* (Hayata) Tagawa (197) *P. mollis*
Endemic

XXVI-III. **Loxogrammeae**

(101) *Loxogramme* (198*)
593. *L. chinensis* Ching (199) Not mentioned
S. China
594. *L. formosana* Nakai —
China (Szechwan, Kweichow)
595. *L. grammitoides* (Bak.) C. Chr. —
Japan, S. China
596. *L. remote-frondigera* Hayata —
Endemic
597. *L. salicifolia* (Makino) Makino *L. salicifolia*
L. biformis
Japan, Ryukyus, S. Korea, S. China, Indo-China, N. India

XXVII. **Grammitidaceae**

(102) *Calymmodon*
598. *C. cucullatus* (Nees et Bl.) Presl (200) *C. gracillimus*
Tropical Asia, north to S. China (Hainan)
599. *C. gracilis* (Fée) Copel. —
Malesia
(103) *Grammitis*
600. *G. tenuisecta* (Bl.) Ching *Ctenopteris tenuisecta*
Malesia
601. *G. subfalcata* (Bl.) Ching *C. subfalcata*
China (Yunnan, Tibet), India, Nepal, Thailand, Ceylon, Malesia
602. "*Ctenopteris curtisii* (Bak.) Tagawa" —
Malesia
603. "*C. obliquata* (Blume) Tagawa" —
Ceylon, S. India, Vietnam, S. China (Hainan), Malesia

604. *"C. merrittii* (Copeland) Copeland" (201)	Not mentioned
Philippines, Borneo	
605. *"C. mollicoma* (Nees et Blume) Kunze" (202*)	Not mentioned
Philippines, Celebes, Borneo, Java	
606. *G. adspersa* (Bl.) Bl.	*G. adspersa*
	G. nuda
Malesia, Indo-China, Australia, Fuji	
607. *G. reinwardtii* Bl.	—
Malesia, Ceylon	
608. *G. fenicis* Copel. (203*)	*G. dorsipila*
	G. jagoriana
Philippines (Batan Is.)	
609. *G. intromissa* (Christ) Parris (204)	*G. latifolia*
Malesia	
610. *G. congener* Bl. (205)	*G. setosa*
Indo-China, Malesia except Moluccas and New Guinea	
611. *G. okuboi* (Yatabe) Ching	*Xiphopteris okuboi*
Japan, S. China (Hainan)	
(104) *Prosaptia*	
612. *P. contigua* (Forst.) Presl	—
Ceylon, S. India, Malesia, Polynesia	
613. *P. urceolaris* (Hayata) Copel.	—
S. China (Kwangtung, Kwangsi), Indo-China, Philippines	
614. *P. kanashiroi* (Hayata) Nakai ex Yamamoto (206)	Not mentioned
Ryukyus	
(105) *Scleroglossum*	
615. *S. pusillum* (Bl.) v. A. v. R.	—
S. China (Hainan), Thailand, Vietnam, Malesia	

XXVIII. Salviniaceae

(106) *Salvinia*	
616. *S. natans* (L.) All.	—
Europe, Asia, Africa, North America	
(107) *Azolla*	
617. *A. pinnata* R. Brown	—
Africa, Asia, Australia, Pacific Islands	

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3. ADDITIONS TO AND CORRECTIOS OF THE PTERIDOPHYTIC FLORA OF TAIWAN (Li *et al.* 1975)

1. Taxonomy after Komarov (1934) 115.
2. *Lycopodium serratum* var. *longipetiolatum* and var. *myriophyllum* are only two forms of *Lycopodium serratum* as shown by intermediates found in Taiwan. The leaves may be from entire and elliptical to strongly toothed and narrowly linear.

   Lycopodium serratum Thunb. Fl. Japon. 341. 1784. Type from Japan (Photograph in Nakaike 1982b).

   L. serratum Thunb. var. *myriophyllifollium* Hayata, Icon. pl. Formos. 4: 133. 1914, *syn. nov.* Type from Taiwan, *Mori 6208*, holotype (TI!).
3. There is no authentic material of *Lycopodium phlegmaria* in the Linnean Herbarium; as lectotype may be chosen plate 61, *Lycopodium* 5 of Dillenius' Historia Muscorum, or the specimen on which it was based. Alston in Tardieu-Blot *et* Christensen (1951) 553 stated "*Phlegmaria* of Linnaeus comprises many species, the specimen in Herb. Hermann is *L. macrostachys* Hook. ...", but Dillenius' plate 61 is quite different from *L. macrostachys* and similar to the so-called *L. phlegmaria* as occurring in the southern part of East Asia, except for the shape and direction of the leaves at the base of the stem. This, I think, is a very important character for distinguishing *Lycopodium* species, for example *L. squarrosum* and *L. cunninghamioides*. The true identity of "*L. phlegmarir*" in East Asia is still unknown.
4. Ching (1982) 124 published the new name *Phlegmariurus taiwanensis* to replace *Lycopodium pulcherrimum* Wall. *ex* Hook. *et* Grev., reported by Hayata (1914) 132 as present in Taiwan. Hayata did not validly publish *Lycopodium pulcherrimum* as a new species (*nomen nudum*), so that Ching's *Phlegmariurus taiwanensis* was not validly published either.

   Lycopodium taiwanense Kuo, *sp. nov.*

   Radices basi caulis ramosae. Caulis pendulus, 18-20 cm longus, cum foliis 1.5 cm latus, 2-4-plo furcato-ramosus. Folia spiraliter disposita, linearia, 1 cm longa, 1mm lata, apice acuta, obscure costata, folia superiora quam inferioribus breviora. Caulis medio sursum toto longitudine sporangiifer. Sporangia axillaria reniformia, 1-1.2 mm lata.

   Holotype: Taiwan, Mt. Dabu, *Masamune s.n.*, Dec. 25, 1930 (TAI).

   Endemic, not rare but scattered, mostly in *Chamaecyparis* forests, 1,800-2,500 m.

This is a close relative of the Himalayan *L. pulcherrimum*, but smaller and of thinner texture. As stated by Ching (1982) 120, 124, the differences between these two species are:

	Width of branch including leaves	Leaf length	Colour of leaves when dry	Sporophylls
L. taiwanense	1.5 cm	1.0 cm	brownish green	shorter than vegetative leaves
L. pulcherrimum	2.5 cm	1.5 cm	green	same length with vegetative leaves

5. Ching (1982) 222 listed many points of difference between *Lycopodium pseudoclavatum* and the European *L. clavatum*: leaves on the main stem more lax, entire, main branches three times dichotomously branched, branchlets columnar, leaves dense and narrower (ca. 0.6 mm in width), narrowly lanceolate, rigid and thick, arching inwards and obliquely inserted, with deciduous, transluscent, shorter hair tips, every peduncle bearing 3–5(–6) longer strobili.

There are two species of the *Lycopodium clavatum* group in Taiwan: *L. pseudoclavatum* mentioned above and *L. japonicum* Thunb., see next paragraph. The former is associated with *Miscanthus* grassland or short bamboo grassland and the latter with forest vegetation, although they occur at the same altitudes, mainly from 1,800–2,500 m.

6. Taxonomy after Ching (1982) 219. Ching (1982) 222 stated that *L. japonicum* differs from *L. pseudoclavatum* in its taller, weaker plant body, laxer, thinner, spreading leaves, lateral branchlets inserted at a larger angle, longer peduncle with 5–6(–8) strobili on longer stalks.

7. Taxonomy after Komarov (1934) 116.

8. Taxonomy after Wilce (1965) 148. Here I include also the "Chinese plant" of Wilce (1965) 158. All Taiwanese specimens of *L. multispicatum* seen by me are Wilce's "Chinese plant" and differ only slightly from typical *L. multispicatum* from Luzon (*Merrill 963*, cited by Wilce (1965) 219, 2 sheets in Z), the type locality.

9. **Lycopodium yueshanense** Kuo, *sp. nov.*

L. wightianum sensu DeVol *et* Kuo (1979) 108, *non* Hook. *et* Grev.

L. complanatum sensu DeVol in Li *et al.* (1975) 39, *pl. 6* (except the creeping stem), *non* L.

Planta herbacea perennis. Rhizoma repens, infossum, teres. Rami erecti. Ramuli vegetativi laterales oblique erecti, complanati. Folia lateralia paululum incurvata. Pedunculi plerumque 2, uno anno tardius quam rami fertiles apparentes, 1–3 strobilos pedicellatos ferentes.

Holotype: Taiwan, Chiayi, Pai-yun-shan-chuang to Yu-shan-chien-shan, *C. Hsu s.n.* Nov. 18, 1968 (TAI).

Endemic species, known only in alpine regions around 3,000 m, in grassland.

There are three species of the *L. complanatum* complex in Taiwan, viz. *L. veitchii*, *L. yueshanense*, and *L. multispicatum*. The second species seems to

be intermediate between the other two both morphologically and ecologically. *L. veitchii* usually occurs in short-bamboo grassland above 3,000 m, *L. multispicatum* grows in *Miscanthus transmorrisonensis* grassland or in open places in coniferous forests from 1,800–2,500 m but may go down to 1,000 m or up to 3,000 m; *L. yueshanense* grows in an ecological niche intermediate between these two kinds of vegetation, namely, in mixed grassland of both short-bamboo and *Miscanthus* or in either kind of grassland around 3,000 m; in altitude it is more restrict than the two other species.

DeVol *et* Kuo (1979) gave the morphological differences between *L. yueshanense* (as *L. wightianum*) and *L. multispicatum*.

10. DeVol *et* Kuo (1979) 109 reported *Selaginella uncinata* from Taiwan, but actually it is an escaped garden plant. The species is known only in a few places, all near private gradens in N. Taiwan.

11. Tagawa (1973) 177 published a new species, *Selaginella pseudonipponica* omitted from Li *et al.* (1975), from Taiwan, and failed to mention the occurrence of *S. nipponica* in Taiwan. The new species was said to differ from *S. nipponica* in its median leaves being ovate with ciliate margin; and the type locality is a limestone area of E. Taiwan in open or lightly shaded places. After examining all specimens named *S. nipponica* from Taiwan in TAI, I have come to the conclusion that no line can be drawn between *S. nipponica* and *S. pseudonipponica*; especially some specimens from humid short grassland in central Taiwan exactly match typical *S. nipponica* from Japan.

Selaginella nipponica Fr. *et* Sav., Enum. Pl. Jap. 2: 199. 1877, *n.n.*, 615. 1878. Type from Japan, Yokoska, an isosyntype seen in K.

S. pseudonipponica Tagawa (1973) 177, *syn. nov.* Type from Taiwan, Hualien, *Ohwi 1126*, holotype in KYO!

12. *Sasaki s.n.* Nov. 7, 1932 and *Suzuki 18476* (all in TAI) cited by DeVol in Li *et al.* (1975) 65 as *Botrychium japonicum* are really *B. daucifolium*. I have never seen a true *B. japonicum* from Taiwan. The name adopted in Li *et al.* (1975) was mainly based on older Japanese literature, where the name *B. japonicum* was used for the plant of Taiwan now named *B. daucifolium*. *B. japonicum* must be excluded from the fern flora of Taiwan.

13. In leaf shape, *Ophioglossum petiolatum* and *O. austroasiaticum* are very variable and sometimes very difficult to distinguish without examination of spore characters, but elevationally they are very distinct: *O. petiolatum* grows in short grassland below 700 m, rarely up to 1,000 m, *O. austroasiaticum* in open places around 3,000 m. I have never seen any *Ophioglossum* species at middle elevations in Taiwan. Li *et al.* (1975) 70 mentioned another related species, *O. vulgatum*, but the specimens cited are *O. austroasiaticum*. Wieffering (1964) 327 reduced both *O. petiolatum* and *O. austro-asiaticum* to *O. reticulatum*, but as mentioned by Brownlie (1977) 46, *O. petiolatum* and *O. reticulatum* are ecologically distinct.

14. *Ophioglossum reticulatum* is a new record for the fern flora of Taiwan; it was collected on Botel Tobago (Tienchin, *C. M. Kuo s.n.* in 1972, TAI).

The differences between *O. reticulatum* and *O. petiolatum* were already pointed out by Brownlie (1977) 45, 46.

15. Taxonomy after Tagawa *et* Iwatsuki (1979) 45.

16. Taxonomy after Iwatsuki (1975) 170.

17. DeVol (1979) 6.

18. There are four Taiwanese entities of *Dicranopteris* recognized by modern pteridologists (Tagawa 1966, DeVol in Li *et al.* 1975), usually as four varieties of *D. linearis* (Burm. f.) Underw., but after my observations in the field, I think they are worthy of species rank. The table shows their ecological characters in Taiwan. The morphological differences between these four species are well described by Holttum (1959), Tagawa, and DeVol, all at variety rank.

	Vegetation zone	Habitat
D. linearis	subtropical	edge of forest, in thickets
D. subpectinata	subtropical	edge of forest, scattered, scandent
D. tetraphylla	subtropical	in forest, scattered, scandent
D. taiwanensis	warm-temperate	in forest, scattered, scandent

19. **Dicranopteris subpectinata** (Christ) Kuo, *comb. nov.*
Gleichenia subpectinata Christ, Bot. Tidsskr. 24: 111. 1901. Type from S. Thailand, Koh Chang Isl., *Schmidt* (P!).

20. **Dicranopteris tetraphylla** (Rosenst.) Kuo, *stat. nov.*
Gleichenia linearis var. *tetraphylla* Rosenst. Fedde Rep. 13: 213. 1914. Type from Sumatra.

21. **Dicranopteris taiwanensis** Ching *et* Chiu in Chien *et* Chun (1959) 346. Type from Taiwan.
D. linearis var. *montana* Holttum, Reinwardtia 4: 276. 1957, *syn. nov.* Type from the Malay Peninsula.
Although the type of *Dicranopteris taiwanensis* Ching *et* Chiu was not seen by me, the type locality is in Taiwan and judging from the key characters used by R.C. Ching in Chien *et* Chun (1959) 117, the plant has: i) two accessary branchlets at the base of each ultimate fork, ii) its ultimate segments are 8 mm in width, iii) a dormant bud at the base of each ultimate fork without bracts. The only *Dicranopteris* taxon in Taiwan, which can fit the criteria mentioned, is *D. linearis* (Burm. f.) Underw. var. *montana* Holtt.

22. Lai (1976) 82.

23. **Hymenophyllum simonsianum** Hook. Sec. Cent. Ferns, *pl. 13.* 1860. Type from NE. India (Khasya Hills).
H. alishanense DeVol, Taiwania 15: 283, *pl. 6.* 1970, *syn. nov.* Type from Taiwan, Alishan, *Ito 25* (Holotype in TAI!).

24. The following is a brief comparison between the names used for *Hymenophyllum* (s. str.) in Li *et al.* (1975) 116 and at present:

Li *et al.* (1975) 116	At present
H. taiwanense	*H. devolii*
H. alishanense	*H. simonsianum*
H. barbatum	*H. barbatum*
H. simonsianum	*H. barbatum*

25. A new record for the fern flora of Taiwan.

Hymenophyllum paniculiflorum Presl, Hymen. 147. 1843; Copeland, Phil. J. Sci. 64: 110. 1937.—*Mecodium paniculiflorum* (Presl) Copel. Phil. J. Sci. 67: 19. 1938; Chien *et* Chun (1959) 142. Type from Luzon.

This is a dwarf fern resembling *H. wrightii* but with the sori crowded at the apex of the frond. Three specimens from Taiwan seen in Z: *Kramer, Zogg et Gassner 7706, 7843, 7844a.*

26. Taxonomy after Chien *et* Chun (1959) 143, as *Mecodium microsorum.*

27. Tagawa (1940b) 140, as *Mecodium productum.*

28. **Hymenophyllum badium** Hook. *et* Grev. Ic. Fil. *pl. 76.* 1828. Type from India Orientalis, *Wallich s.n.* (K!).

H. crispatum Wall. *ex* Hook. *et* Grev. Ic. Fil. *pl. 77.* 1828, *syn. nov.* Type from Nepal (photograph seen in Nakaike 1982b, p. 118).

H. crispato-alatum Hayata, Icon. Pl. Formos. 5: 256. 1915, *syn. nov.* Syntypes from Taiwan, *Hayata et Sasaki s.n.* (syntype, TI!); inter Heishana *et* Nimandaira, *Hayata et Ito s.n.* (two syntypes, TI!).

29. **Hymenophyllum javanicum** Sprengel, Syst. Veg. 4: 132. 1827. Type from Java.

H. fimbriatum J. Sm. *ex* Hook. Sp. Fil. 1: 102, *pl. 36C.* 1844, *syn. nov.* Type from Luzon.

H. riukiuense Christ, Ann. Cons. Jard. Bot. Geneve 4: 208. 1900, *syn. nov.* Type from Ryukyus, *Ferrié 187* (P!).

30. Tagawa (1940b) 141, as *Mecodium taiwanense.*

31. Taxonomy after Sledge (1968) 298.

32. Taxonomy after Sledge (1968) 299. Iwatsuki (1958) 162, as *Gonocormus diffusus.*

33. Taxonomy after Tagawa *et* Iwatsuki (1979) 84.

34. The indusia of all specimens of *Trichomanes pyxidiferum* and *T. latifrons* collected from Taiwan seen in Taipei herbaria (TAI, TAIF), have a very broad wing, typical of *T. latifrons.* The record of *T. pyxidiferum* from Taiwan is erroneous.

35. Tagawa (1939) 164.

36. **Trichomanes thysanostomum** Makino, Bot. Mag. Tokyo 12: 193. 1898, *nom. nud.*; 13: 46. 1899. Type from the Ryukyus, *Tashiro 10* (3 Syntypes, TI!).

T. grande Copeland, Phil. J. Sci. Bot. 6: 70. 1911, *syn. nov.* Type from the Philippines, *Copeland 1739,* not seen; *Merrill 632, Elmer 9050,* cited by

Copeland (1933) 225, seen in Z.

37. **Trichomanes latealatum** (v. d. Bosch) Christ, Verh. Nat. Ges. Basel 11: 424. 1896.—*Didymoglossum latealatum* v. d. Bosch, Ned. Kruidk Arch. 5: 138. 1863. Type from India orientalis, *Griffith* (K!).

T. palmifolium Hayata, Ic. pl. Formos. 4: 138, *f. 78*. 1914, *syn. nov.* Type from Taiwan, Arisan, *Hayata et Sasaki s.n.* (holotype, one isotype seen in TI).

38. Tagawa *et* Iwatsuki (1979) 92.

Key to the species of the *Crepidomanes* group in Taiwan:

1. Submarginal false vein absent ..... *T. latealatum*
1. A continuous or interrupted submarginal vein present ..... 2.
2. Submarginal vein interrupted, other false veins numerous, fronds more than 3 cm long ..... *T. bilabiatum*
2. Submarginal vein continuous or rarely interrupted, other false veins few or none, fronds less than 2 cm long ..... 3.
3. Marginal cells in one row, ultimate segments to 0.7 mm broad .... *T. kurzii*
3. Marginal cells in two rows, ultimate segments more than 0.7 mm broad ..... *T. latemarginale*

39. Taxonomy after Tindale (1963) 4, 33, as *Microgonium tahitense*.

40. Taxonomy after Chien *et* Chun (1959) 100.

41. **Plagiogyria euphlebia** (Kunze) Mett. Farngatt. Plagiogyria 10, n. 6. 1858. —*Lomaria euphlebia* Kunze, Bot. Zeit. 1848: 521. Syntypes from Japan, *Goering s.n.* (not seen) and *Zollinger s.n.* (photograph in Nakaike, 1982b, p. 232).

P. grandis Copel. Phil. J. Sci. 38: 389. 1929, *syn. nov.* Type from Kweichow, Pinfa, *Cavalerie s.n.* (Rosenst. Fil. Chin. 171) (*US 1096007, 1096008*), (photographs in Nakaike, 1971, *pl. 2, fig. 1*; Copeland, 1929, *pl. 1*).

42. Taxonomy after Nakaike (1971) 258.

43. There are two species of *Cibotium* in Li *et al.* (1975) 131, i. e., *C. barometz* and *C. cumingii*, but Gastony (1982) 968 noted that the spores in Taiwanese and in Philippine material of *C. cumingii* are different. The hairs on the lower surface of the pinnules in material of both *C. barometz* and "*C. cumingii*" from Taiwan are thin and flaccid and usually get interwoven into scalelike masses. *C. cumingii* from the Philippines (type locality) has two kinds of hairs, spreading, stiff hairs and long twisted hairs. "*C. cumingii*" from Taiwan is certainly different from true *C. cumingii* of the Philippines, and was also shown in Li *et al.* (1975) 131 to differ from *C. barometz*. "*C. cumingii*" from Taiwan must be newly described.

Cibotium taiwanense Kuo, *sp. nov.*

C. cumingii sensu DeVol, Fl. Taiwan 1: 132, *pl. 44*. 1975, *non* Kunze.

Rhizoma repens, crassum, apice dense pilosum. Stipes usque ad 2 m longi, viridis, basi dense pilosus. Pili lineares, 1–2 cm longi. Lamina tripinnatifida, ad 2.5 m longa. Pinnae basi inaequales, pinnulis inferioribus basiscopicis nullis. Pinnulae usque ad 15 cm longae, 25 mm latae, profunde pinnatisectae, segmentis linearilanceolatis, acutis. Sori utroque latere costulae binis plerumque unus aut duo basi segmenti insertis. Valvae inaequalibes, externa major, interna angustior, tenuiter coriaceae.

Holotypus: *C. M. Kuo 1703*, Taiwan, Hsinchu, Chu-tong (TAI). Further specimens see DeVol in Li *et al.* (1975) 132, cited under *C. cumingii*.

C. taiwanense is very near *C. barometz*, but the lower two to four basiscopic pinnules of the lower pinnae are lacking, sori per segment usually in one to two pairs; it is also close to *C. cumingii* but lacks the spreading stiff hairs or abundant long tangled hairs on the lower surface of the pinnules. The spores of *C. taiwanense* are also distinct, lacking ridges, whereas those of *C. barometz*, *C. cumingii*, and *C. arachnoideum* all have prominent ridges.

44. *Cyathea* sensu Holttum (1963) 72 is followed here.

45. Christensen (1905-1906) 191. Although *Alsophila deniculata* Baker, J. Bot. 23: 102. 1855 is an older name than *Cyathea hancockii* Copel. Phil. J. Sci. 4: 35. 1909, the epithet cannot be used, being preoccupied by *Cyathea denticulata* Goldm. Nova Acta 19. Suppl. 1. 466. 1843.

46. Taxonomic position at present unclarified, see Tryon *et* Tryon (1982) 280, as *Hemionitis vestita*.

47. Taxonomic position at present unclarified, see Tryon *et* Tryon (1982) 280.

48. **Cheilanthes subargentea** (Ching) Kuo, *comb. nov.*

Aleuritopteris subargentea Ching in Wu (1981) 65, *pl. 2* (*4-5*). Type from China (Yunnan), *K. M. Feng 6059* (Holotype in HP, not seen). Two specimens, *Maire 6112* and *6649* from Yunnan, seen in Z.

This is a new record for the fern flora of Taiwan, based on *Ou et Kao 9379* collected from Hualien, Chin-shuie (Z). As said by Ching *et* Wu in Wu (1983) 79, the species is close to *Aleuritopteris argentea* but differs distinctly in the shape of blade, the pinnae from the second lowest pair of pinnae upwards being cordate and never decurrent.

49. **Cheilanthes agetae** (Saiki) Kuo, *comb. nov.*

Aleuritopteris agetae Saiki (1984) 1. Type from Taiwan, Alishan, *Faurie 506* (KYO!)

50. Saiki (1984) 4, as *Aleuritopteris dealbata* Fée. **Saiki (1984) 8 mentioned *A. mexicana* Fée also occurs in Taiwan, but here adopt the name *Cheilanthes krameri* Fr. *et* Sav.

51. **Cheilanthes chusana** Hook. Sp. Fil. 2: 95, *pl. 106B*. 1852. Type from Chusan, *Alexander s.n.* (K!).

C. mysurensis sensu Li *et al.* (1975) 282, *non* Wall. *ex* Hook. (The type of *C. mysurensis*, from S. India, seen in K).

52. **Onychium lucidum** (Don) Sprengel, Syst. Veget. 4: 66. 1827.—*Leptostegia lucida* Don, Prodr. Fl. Nepal. 14. 1825. Type from Nepal, Hamilton *s.n.*, not seen. Taxonomy after Ching *et* Wu in Wu (1983) 77, 78.

O. contiguum sensu Li *et al.* (1975) 287, *non* Hope. (The type of *O. contiguum* Hope, Wall. Cat. 72, seen in K).

53. Parris (1980) discussed the indument of *Adiantum hispidulum* and *A. pubescens* and regarded them as distinct. In its indument, so-called *A. hispidulum* or *A. pubescens* from Taiwan apparently differ from typical *A. hispidulum* and typical *A. pubescens* as described by Parris. I think this is an

as yet unravelled species complex much like "*A. caudatum*" in Taiwan.

54. This is a species not mentioned in Li *et al.* (1975). Henry (1896) 110 first recorded the occurrence of this species in Taiwan based on *Playfair 197* (now in K) and *Henry s.n.* (one sheet in B, two sheets in P), and the species was not recollected until 1981 by *Saiki et al. 510* (Z).

55. Sinha *et* Manton (1970) 249. This species is near *A. caudatum* but differs in its longer stipe and the lowest pinnae being the largest and fan-shaped.

56. Tagawa (1938c) 315.

A. edentulum sensu Shieh in Li *et al.* (1975) 305, *non* Christ. (Syntypes of *A. edentulum* Christ, *Delavay 1523* and *1697*, seen in P).

57. DeVol *et* Kuo (1979) 111 reported the occurrence of *Pteris ryukyuensis* in Taiwan, but the only collection, *DeVol 8357*, was from a house in Taipei City, very abundant on a brick wall but presumably introduced by unknown means.

58. Taxonomy after Anonymous (1972) 150, Wu (1983) 68.

59. **Pteris pellucidifolia** Hayata, Gen. Ind. Fl. Formos. 114. 1916; T. Ito, (Illustrations of Formosan plants supplement) 262. 1928. —*P. pellucida sensu* Hayata, Ic. Pl. Formos. 4: 241. 1914, *non* Presl. Type from Taiwan, Arisan, *Hayata et Sasaki s.n.* Jan. 1912 (TI!).

P. cretica L. var. *laeta sensu* Shieh in Li *et al.* (1975) 294, *non* Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 5. 1940. (Type of *P. cretica* var. *laeta*, Wall. Cat. 95 seen in K, may be conspecific with *P. nipponica* Shieh).

60. **Pteris dimidiata** Willd. Sp. Pl. 5: 381. 1810. Type from India orientalis (3 sheets in B, Herb. Willdenow!).

P. semipinnata sensu Shieh in Li *et al.* (1975) 298, *non* L.

61. **Pteris semipinnata** L. Sp. Pl. 2: 1076. 1753. Type from China, *Osbeck s.n.* (one specimen seen in LINN with the handwriting of Linnaeus "18 semipinnata").

P. dispar Kunze, Bot. Zeit. 6: 539. 1848, *syn. nov.* Type from Japan, *Goering s.n.*, not seen.

62. Wu (1983) 70.

63. The first record of this species from Taiwan may be Hooker, Sp. Fil. 5: 266. 1864. It is supposedly based on a Wilford collection from NE. Taiwan in June 1858 (No. 510, one specimen seen in K). The collecting date is confirmed by Bretschneider, E. 1898: History of European botanical discovesies in China 1: 540. There are two more specimens in K: *Hancock 48* collected in 1881 and *Oldham s.n.* 1864. Except for these three collections, none had been made again till DeVol *et* Kuo (1979) 106.

64. According to Iwatsuki (1975) 204, *Vittaria mediosora* can not be recognized as a species but is only an extreme form of *V. taeniophylla*. His judgment is accepted here.

65. **Microlepia intramarginalis** (Tagawa) Serizawa, Journ. Jap. Bot. 47: 48. 1972. —*M. strigosa* (Thunb.) Pr. var. *intramarginalis* Tagawa, Acta Phytotax. Geobot. 10: 202. 1941. —*M. calvescens* (Wall. *ex* Hook.) Pr. var. *intramarginalis*

(Tagawa) Shieh, Quart. J. Chin. Eor. 6: 92. 1973; in Li *et al.* (1975) 248. Type from S. Taiwan, *Tagawa 1482* (holotype seen in KYO).

M. marginata (Panzer) C. Chr. var. *bipinnata sensu* Tagawa, Acta Phytotax. Geobot. 10: 202. 1941; Shieh in Li *et al.* (1975) 250, *non* Makino.

66. *Microlepia sinostrigosa* Ching was newly found in Taiwan by Prof. Saiki of Kobe-Gakuin University (*T. Murakami, Y. Saiki and C. M. Chen 349* from the N. Cross-Island Highway, alt. 1,100 m. Dec. 24, 1980 (Z)). *M. sinostrigosa* differs from its relative *M. strigosa* in its herbaceous foliage, hairy adaxial surfaces of costae, and the indusia being far from the leaf margin.

67. **Microlepia krameri** Kuo, *sp. nov.*

Rhizomate late repente, 5 mm crasso. Frondes distantes, stipite 45 cm longo, dense piloso ad leviter scaberulo. Lamina 80 cm longa, 50 cm lata, ovato-oblonga, bipinnata; pinnae 25 cm longae, 5 cm latae, ca. 15-jugae, 4–8 cm inter se distantes, alternae, oblique patentes, petiolulo 2–4 mm, superne ad costas pilosae; pinnulae ca. 25-jugae, alternae, ca. 1 cm inter se remotae, rhomboideo-oblongae, basi cuneatae, sessiles, margine crenato-incisae, venis infra prominulis, pilosis; textura tenuiter chartacea, flavovindes; sori intramarginales, indusiis sparsissime puberulis.

The bipinnate frond and well-spaced pinnules make this species very distinct among the other Microlepia species of Taiwan. The nearest species is *M. intramarginalis* (Tagawa) Serizawa but differs in separate, well-spaced pinnules, the adaxial surface of the costae being densely hairy, and thinner texture. The species is dedicated to Prof. K. U. Kramer of Zürich University.

The species is known only from N. Taiwan, locally abundant in open places near the edge of secondary forest. *C. M. Kuo 12254*, Taipei, Toutingli, alt. 150 m (Holotype TAI).

68. Taxonomy after Morton (1974) 315.

Microlepia rhomboidea (Wall. *ex* Kunze) Prantl, Arb. Bot. Gart. Breslau 1: 31. 1892.—*Davallia rhomboidea* Wallich, Num. List no. 257. 1829, *nom. nud.*; *ex* Kunze, Bot. Zeit. 8: 158. 1850. Type from Nepal, *Wallich 257* (K!).

M. taiwaniana Tagawa, Acta Phytotax. Geobot. 10: 199. 1941; Shieh in Li *et al.* (1975) 251, *syn. nov.* Type from S. Taiwan, *Tagawa 1929* (Holotype in KYO!).

M. trapeziformis sensu Shieh in Li *et al.* (1975) 252, *non* (Roxb.) Kuhn.

69. Serizawa (1972) 46, as *Microlepia herbacea* Ching *et* C. Chr. var. *trichosora* (Ching) Serizawa.

70. Taxonomy after Anonymous (1972) 148.

71. **Paesia radula** (Bak.) C. Chr. Ind. Fil. 476. 1906.—*Pteris radula* Baker, J. Bot. 1880: 221. Type from W. Sumatra, *Beccari 417* (K!).

P. taiwanensis Shieh, Journ. Jap. Bot. 45: 161, *f. 1.* 1970, *syn. nov.* Type from S. Taiwan, *Shieh 1090* (Holotype seen in Herb. Chung-hsing Univ. Taichung, Taiwan).

72. Taxonomy after Nakaike (1975) 78.

73. Kramer (1972) 34.

74. Key to the species of *Tapeinidium* from Taiwan

1. Frond pinnate.....*T. pinnatum*
1. Frond bipinnatifid..... 2.
2. Rachis abaxially sharply carinate, with a continuous purple band on each side.....*T. gracile*
2. Rachis abaxially obtusely carinate, without purple band.....*T. biserratum*

75. Kramer (1972) 8.

76. Taxonomy after Ching in Chien *et* Chun (1959) 255. As said by Ching, Malesian *Monachosorum subdigitatum* (Bl.) Kuhn differs from East Asiatic *M. henryi* Christ in its much larger, more finely divided fronds, smaller ultimate segments with rounded, never pointed apex, and larger sori. Iwatsuki in Ohashi (1975) also stated: "We usually observe conspicuous bulbils on the rachis of *M. henryi*, though the bulbils are hardly found in *M. subdigitatum*."

77. **Thelypteris griffithii** (Moore) Kuo, *comb. nov.*
Dictyocline griffithii Moore, Gard. Chron. 1855: 854. Type from Assam.

78. **Thelypteris griffithii** (Moore) Kuo var. **wilfordii** (Hook.) Kuo, *comb. nov.*
Hemionitis wilfordii Hook. Exot. Ferns, *pl. 93.* 1859. Type from Taiwan, *Wilford 503* (K!).

79. **Thelypteris dictyoclinoides** (Ching) Kuo, *comb. nov.*
Stegnogramma dictyoclinoides Ching, Sinensia 7: 92. 1936. Type from China (Yunnan), *Tsai 62728* (PE, not seen, photograph in Ching, 1936a, *pl. 1*).

80. **Thelypteris tottoides** (H. Ito) Kuo, *comb. nov.*
Leptogramma tottoides H. Ito, Bot. Mag. Tokyo 49: 434. 1935. Type from Taiwan, *Hayata et Sasaki s.n.* (TI!).

81. **Thelypteris paludosa** (Bl.) K. Iwats. Acta Phytotax. Geobot. 19: 11. 1961, *excl. syn.—Polypodium paludosum* Bl. Fl. Jav. Fil. 192, *t. 90.* 1851. Type from Java, *Blume s.n.* (L!).
Dryopteris subaurita Tagawa, Acta Phytotax. Geobot. 1: 57. 1932.—*Phegopteris subaurita* (Tagawa) Tagawa, Acta Phytotax. Geobot. 7: 73. 1938.—*Pseudophegopteris subaurita* (Tagawa) Ching, Acta Phytotax. Sin. 8: 315. 1963.—*Thelypteris subaurita* (Tagawa) Ching, Bull. Fan Mem. Inst. Biol. 6: 267. 1936, *syn. nov.* Type from Taiwan, *T. Ito s.n.* (KYO!).

82. **Thelypteris pyrrhorhachis** (Kunze) Kuo, *comb. nov.*
Polypodium pyrrhorhachis Kunze, Linnaea 24: 257. 181. Type from Nilgiris.

83. Kuo (1982) 85, as *Pseudophegopteris levingei* (Clarke) Ching, Kuo *et* Jeng (1978) as *Pseudophegopteris aurita* (Hook.) Ching.

84. Taxonomy afthe Nakaike (1982b) 336.
Thelypteris leveillei (Christ) Kuo, *comb. nov.*
Drypoteris leveillei Christ, Bull. Acad. Int. Géogr. Bot. 20. Mem. 176. 1909. Type from Pin-Fa, *Cavalerie 326* (P!).

85. Iwatsuki (1965) 156.

86. Holttum (1976) 27, as *Coryphopteris hirsutipes* (Clarke) Holttum.

87. A new record for the fern flora of Taiwan, identified by Prof. Zogg based on *Zogg et Gassner 6240* from Taitung, Haituan, alt. 1780 m (Z).

Thelypteris tylodes (Kunze) Ching, Bull. Fan Mem. Inst. Biol. Bot. 6: 296. 1936.—*Aspidium tylodes* Kunze, Linnaea 24: 283. 1851.—*Pseudocyclosorus tylodes* (Kunze) Ching, Acta Phytotax. Sinica 8: 323. 1963; Holttum, Kew Bull. 34: 503. 1979. Type from S. India.

88. Panigrahi (1975) 496.

89. **Thelypteris latipinna** (Benth.) K. Iwats. Acta Phytotax. Geobot. 21: 166. 1965.—*Aspidium molle* var. *latipinna* Benth. Fl. Hongkong. 455. 1861. Type from Hong Kong, *Hance 135* (K!, selected as lectotype by Morton, 1974, p. 361).

90. Holttum (1981b) 460.

91. **Thelypteris ramosii** (Christ) Kuo, *comb. nov.*

Dryopteris ramosii Christ, Philip. J. Sci. 2. Bot. 203. 1907. Type from Luzon, *Ramos 1792* (lectotype selected by Holttum 1981b, p. 537, not seen, four specimens from the type locality seen in Z, they are *Elmer 7619, 7969, 7988, 17851*).

92. **Thelypteris gymnopteridifrons** (Hayata) Kuo, *comb. nov.*

Dryopteris gymnopteridifrons Hayata, Ic. Pl. Formos. 8: 148, *f. 75, 76*. 1919. Type from Taiwan, *T. Soma s.n. 1912* (TI!).

93. Nomenclature after Pichi Sermolli (1977a) 252.

94. DeVol *et* Kuo (1979) 106.

95. In Taiwan two species of *Pleocnemia* can be distinguished: one has larger fronds about two meters tall, and indusiate sori, the other has smaller fronds about one mater tall, and exindusiate sori. Although the indusial character is not visible in the type specimens of both *Pleocnemia rufinervis* (Hayata) Nakai and *P. submembranacea* (Hayata) Tagawa *et* K. Iwatsuki, judging from size alone, the name *P. rufinervis* can be applied to the larger and *P. submembranacea* to the smaller species. *P. winitii* is synonymous with *P. submembranacea*. The glands on the abaxial surfaces are yellow when fresh in both species but sometimes change to red when the material has been slowly dried. *Pleocnemia cumingiana* of Li *et al.* (1975) 336 is a Malesian species, as noted by Iwatsuki (1977) 164, and does not occur in Taiwan.

96. Taxonomy after Holttum (1954) 501, here it includes also so-called *Cteni-topsis* from Taiwan.

97. **Tectaria kusukusensis** (Hayata) Kuo, *comb. nov.*

Dryopteris kusukusensis Hayata, Ic. Pl. Formos. 4: 157. *f. 98*. 1914. Type from Taiwan, *Hayata et Sasaki s.n.* 1912 (TI!).

98. Holttum (1981a) 136 noted that the type of *Tectaria devexa, Zollinger 2717* at LZ, was destroyed and no other isotype is extant, but actually there is an isotype at Z; the specimen is here selected as neotype.

99. Taxonomy after Morton (1973) 217.

100. Tagawa (1938b) 710.

101. Holttum (1981a) 144.

Tectaria simonsii (Bedd.) Ching, Sinensia 2: 32. 1931.—*Aspidium simonsii*

Bedd. Ferns Br. India Suppl. 15, *t. 367*. 1876. Type from Assam, *Simons 301* (K, photograph in Ching 1931, p. 33).

Aspidium kwarenkoense Hayata, Ic. Pl. Formos. 8: 138. 1918.—*Tectaria kwarenkoensis* (Hayata) C. Chr. Ind. Fil. Suppl. 3: 181. 1934; DeVol *et* Kuo in Li *et al.* (1975) 344, *syn. nov.* Type from Taiwan, *Faurie s.n.* (TI!).

102. There are two specimens at Kew (*Tagawa 2764 & 2882*, both from Taiwan), identified by Prof. Holttum as *Tectaria linlaoensis* Ching which has never been reported from Taiwan before. The species looks like a large plant of *T. subtriphylla* but differs in its stipe being darker in colour and shining, its abaxial surface being hairy between the veins, and the indusia having dark red glands.

103. Taxonomy after Price (1982) 201, discussed under *Nephrodium subpedatum* Harr.

104. Iwatsuki (1979) 42.

105. **Arachniodes rhomboidea** (Wall. *ex* Mett.) Ching, Acta Phytotax. Sin. 9: 383. 1964.—*Aspidium rhomboideum* Wall. Cat. no. 364. 1828, *nom. nud.*; *ex* Mett. Farngatt. Pheg. Aspid. 350. 1858. Type from Nepal, *Wallich 364*, two specimens seen in K, Herb. Wallich.

A. amabilis (Blume) Tindale var. *fimbriata* K. Iwats. (1979) 42, *syn. nov.* Type from Japan, *Tagawa 7470* (KYO!).

106. Taxonomy after Sledge (1973) 41.

Arachniodes tripinnata (Goldm.) Sledge (1973) 41.—*Polystichum tripinnatum* Goldm. Nova Acta Acad. Caesar Leop. Carol. 19. Suppl. 1: 463. 1843. Type from Philippines (Manila), *Meyen s.n.* (B, not seen, photograph seen at Kew; duplicates of *Elmer 9949, 17844*, mentioned by Sledge 1973, seen in Z).

Polystichum pseudo-aristatum Tagawa, Acta Phytotax. Geobot. 1: 91. 1932, *syn. nov.* Type from Japan, *Tasiro* (KYO!).

107. Tagawa (1940a) 90.

108. According to Ching *et* Wu in Wu (1983) 248, *Aspidium atratum* Wall. *ex* Kunze was based on a specimen from southern India(*Dryopteris hirtipes* (Blume) Kuntze), and *Dryopteris cycadina* (Fr. *et* Sav.) C. Chr. is the correct name for the Himalayan and east Asiatic "*D. atrata*".

109. Ching (1938) 413.

110. A new record for the fern flora of Taiwan, based on *C.M. Kuo 12353*, collected from Nan-hu-ta-shan, alt. 2,000, in coniferous forest (TAI, Z).

Dryopteris namegatae (Kurata) Kurata, J. Geobot. 17: 89. 1969.—*D. dickinsii* (Fr. *et* Sav.) C. Chr. var. *namegate* Kurata, J. Geobot. 7: 115. 1958. Type from Japan, *Kurata 1098* (TOFO, not seen, photograph in Nakaike 1982b, p. 437).

111. Nomenclature after Ching (1940b) 180.

112. **Dryopteris lepidopoda** Hayata, Ic. Pl. Form. 4: 161, *f. 101*. 1914. Type from Taiwan, *Hayata et Sasaki s.n.* (TI!).

D. taiwanicola Tagawa, Acta Phytotax. Geobot. 8: 230. 1939, *syn. nov.* Type from Taiwan, *Tagawa 356* (KYO!).

113. Fraser-Jenkins in Kramer (1984) 162.

114. *Dryopteris bonatiana* (Brause) Fraser-Jenkins is a new record for the fern flora of Taiwan. It resembles *D. chrysocoma* in its deeply bipinnatifid frond but the scales on the stipe base are dirty brown, appressed, cohering like a sheath. Only one collection is known, *C. M. Kuo 11772A* (TAI, Z), collected between Tatachia-anbu and Paiyun-shan-chuang.

115. Tagawa (1939) 22.

116. **Dryopteris acute-dentata** Ching (1938) 432.—*Nephrodium kingii* Hope, J. Bomb. Nat. Hist. Soc. 12: 621, *t. 9.* 1899, *non Dryopteris kingii* C. Chr. 1905. Type from Panjab.

D. serrato-dentata sensu DeVol *et* Kuo in Li *et al.* (1975) 379, *non* (Bedd.) Hayata.

117. Tagawa (1934) 88.

118. So-called *Dryopteris barbigera* of Taiwan has much smaller fronds, acute laminal teeth without a sharp hair-point, and a more oblong lamina when compared with typical *D. barbigera* from N. India. On the other hand, the specimens agree quite well with *Dryopteris subbarbigera* Ching from Xizang. *Dryopteris subbarbigera* Ching in Wu (1983) 260, *pl. 62* (6).

119. DeVol *et* Kuo (1979) 107.

120. DeVol *et* Kuo (1979) r07.

121. **Dryopteris fructuosa** (Christ) C. Chr. Ind. Fil. 267. 1905.—*Aspidium varium* var. *fructuosum* Christ, Bull. Herb. Boiss. 6: 967. 1898. Type from Yunnan, *Henry 10095* (P!).

D. hypophlebia Hayata, Ic. Pl. Form. 4: 154, *f. 95.* 1914, *syn. nov.* Type from Taiwan, *Hayata et Sasaki s.n.* (TI!).

122. A new record based on a specimen identified by Fraser-Jenkins: *Kramer, Zogg et Gassner 7869*, collected from Alishan, alt. 2,300 m (Z). The species differs from its close relative, *D. fructuosa*, in its acute to blunt pinnae apices and broadly oblong pinnules (ca. 8 mm×5 mm).

123. Tagawa (1939) 231.

124. Serizawa (1971) 20.

125. Serizawa (1971) 17.

126. Price (1977) 244, fig. 1.

127. Serizawa (1971) 19.

128. Toxonomy after Ching (1936b) 96, this species was first reported from Taiwan by Tagawa (1940) 93, as *Cyrtomium falcatum* (L. f.) Presl var. *devexiscapulae* (Koidz.) Tagawa.

129. Nakaike (1982a) 141.

130. Nakaike (1982a) 136.

131. **Polystichum tacticopterum** (Kunze) T. Moore, Ind. Fil. 105. 1858.—*Aspidium tacticopterum* Kunze, Linnaea 24: 290. 1851. Type from S. India, presumably in W as said by Sledge (1973) 35, not seen. Two specimens collected by *Kramer et Nair (6552)* from S. India (Madras) seen in Z.

P. kodamae Tagawa, Journ. Jap. Bot. 13: 186. 1937.—*P. aculeatum* (L.) Roth var. *formosanum* Kodama, Bot. Mag. Tokyo 29: 328. 1915, *syn. nov.* Type

from Taiwan (Alishan), collector not indicated in the original publication (? *Fauie 541*, seen in P).

132. Nakaike (1982a) 142.

133. Nakaike (1982b) 374.

134. Iwatsuki *et* Price (1977) 565.

135. **Diplazium uraiense** Rosenst. Hedwigia 56: 336. 1915. Type from Taiwan, *Faurie 185* (P!).

D. dilatatum sensu DeVol *et* Kuo in Li *et al.* (1975) 463, *non* Blume. (Type of *D. dilatatum* Bl. seen in L).

136. **Diplazium virescens** Kunze var. **okinawaense** (Tagawa) Kurata, Journ. Geob. 7: 77. 1958.—*D. okinawaense* Tagawa, Acta Phytotax. Geobot. 2: 199. 1933. Type from Okinawa, *Koidzumi s.n.* (KYO!).

Asplenium mettenianum Miq. Ann. Mus. Bot. Lugd. Bat. 3: 174. 1867.—*Diplazium mettenianum* (Miq.) C. Chr. Ind. Fil. 236. 1905, *syn. nov.* Type from Japan, *Textor* (L!).

137. Tagawa (1936) 259.

138. Sledge (1962) 312.

Diplazium muricatum (Mett.) v. A. v. R. Mal. Ferns 829. 1909.—*Asplenium muricatum* Mett. Ann. Mus. Bot. Lugd. Bat. 2: 239. 1866. Type from Java (L!).

D. kawakamii Hayata, Mat. Fl. Form. 435. 1911, *syn. nov.* Type from Taiwan, *Kawakami et Nakahara* (TI!).

139. **Diplazium pseudo-doederleinii** Hayata, Ic. Pl. Form. 8: 145, *f. 71-72.* 1919. Type from Taiwan (TI!).

D. phaeolepis Tagawa, Acta Phytotax. Geobot. 5: 259. 1936, *syn. nov.* Type from Taiwan, *Tagawa 476* (KYO!).

140. Tagawa (1940) 90, as *Diplazium asperum* Blume. The use of *D. polypodioides* Blume is after Sledge (1962) 306.

141. **Diplazium amamianum** Tagawa, Acta Phytotax. Geobot. 3: 35. 1934. Type from Ryukyus, Amami Is. *Tasiro s.n.* (KYO!).

A new record for the fern flora of Taiwan, based on *Kramer, Zogg et Gassner 7574*, collected from Chitou, 1,100 m, one frond in three parts (Z).

142. DeVol (1979) 20, based on *C. M. Kuo 11258* (TAI), from Kenting. *Kramer, Zogg et Gassner 7948* (collected in the same place, 2 sheets in Z).

143. **Athyrium epirachis** (Christ) Ching in C. Chr. Ind. Fil. Suppl. III. 41. 1934. —*Diplazium epirachis* Christ, Bull. Soc. Bot. Fr. 52. Mém. 1: 51. 1905. Type from Cnina, Kweichow, *Bodinier 1706* (P!).

A. wardii (Hook.) Makino var. *elongatum* Christ, Bull. Soc. Bot. Fr. 52. Mém. 1: 49. 1905, *syn. nov.* Type from China, Kweichow, syntype *Bodinier 2419*, seen in P.

New to the fern flora of Taiwan, based on *C. M. Kuo 5048* (TAI, Z), collected from Nan-hu-ta-shan.

144. **Athyrium delavayi** Christ, Bull. Soc. Bot. Fr. 52. Mém. 1: 47. 1905. Type from SW. China, *Delavay 5166, 5123, 5035, Henry 1061, Faber s.n.* Mt. Omei (syntypes, seen in P).

Diplazium subrigescens Hayata, Ic. Pl. Form. 4: 219, *f. 149*. 1914, *syn. nov.* Type from Taiwan, *Hayata et Sasaki* (TI!).

Athyrium mairei Rosenst. Rep. Sp. Nov. Fedde 13: 125. 1913, reduced to *A. delavayi* by C. Chr. Ind. Fil. Suppl. III. 42. 1934. Type from Yunnan, *Maire s.n.* (isotype seen in K, BM).

Athyrium elegans Tagawa, Acta Phytotax. Geobot. 3: 33. 1924, *syn. nov.* Type from Japan (Yakushima), *Tagawa 690* (KYO!).

145. **Athyrium otophorum** (Miq.) Koidz. Fl. Symb. Or.-As. 40. 1930.—*Asplenium otophorum* Miq. Ann. Lugd. Bat. 3: 175. 1867. Type from Japan, *Buerger s.n.* (L!).

A. kuratae Serizawa, Journ. Jap. Bot. 45: 117. 1970, *syn. nov.* Type from Japan (Yakushima), *Serizawa 7053* (TNS, photograph seen).

A new record for the fern flora of Taiwan, based on *C. M. Kuo 12396* (TAI, Z). *A. kuratae* Serizawa seems to be only a form of this species.

146. **Athyrium vidalii** (Fr. *et* Sav.) Nakai, Bot. Mag. Tokyo 39: 110. 1925.—*Asplenium vidalii* Fr. *et* Sav. Enum. Pl. Jap. 2: 229. 1879. Type from Japan, *Savatier* (P!).

Asplenium mackinnoni Hope, J. Bot. 124. 1896, *syn. nov.* Type from Himalaya.

147. **Athyrium foliolosum** Bedd. Handb. Suppl. 37. 1892. Type from Himalaya.

A. tripinnatum Tagawa, Acta Phytotax. Geobot. 6: 162. 1937, *syn. nov.* Type from Taiwan, *Tagawa 398* (KYO!).

148. **Athyrium erythropodum** Hayata, Ic. Pl. Form. 4: 233. 1914. Type from Taiwan, *Hayata et Sasaki* (TI!).

A. yakusimense Tagawa, Acta Phytotax. Geobot. 6: 94. 1937, *syn. nov.* Type from Yakusima, *Tagawa 692* (KYO!).

149. Serizawa (1981) 181.

150. Serizawa (1981) 180.

151. Tagawa (1938a) 185.

152. Kato (1984) 389.

153. Ohba (1965) 53, as *Lunathyrium petersenii* (Kunze) H. Ohba.

154. Kato (1984) 393.

155. Kato (1979) 108.

156. Kato (1979) 112.

157. A new record for the Taiwan fern flora, based on *Murakami, Saiki et Chen 344* (Z).

158. Hennipman (1977) 152.

159. Iwatsuki (1959) 59.

160. A revised key to the Taiwanese species of *Elaphoglossum:*

1. Rhizome long-creeping, stipes distant.....*E. angulatum*
1. Rhizome short-creeping, stipes tufted or approximate ..... 2.
2. Lamine decurrent to near the base of the stipe.....*E. yoshinagae*
2. Lomina base cuneate, short-decurrent..... 3.
3. Apex of lamina rounded.....*E. luzonicum*
3. Apex of lamina acute to acuminate..... 4.
4. Rhizome scales 5 mm long.....*E. marginatum*
4. Rhizome scales 10 mm long ..... 5.

5. Scales straight and rather stiff, with inrolled margins.....*E. callifolium*
5. Scales thin, carisped throughout, with long, twisted hairpoints .....*E. commutatum*

161. Iwatsuki *et* Price (177) 353.

162. Sledge (1967) 89.

163. **Elaphoglossum commutatum** (Mett. *ex* Kuhn) v. A. v. R. Malayan ferns and fern allies Suppl. 427. 1917.—*Acrostichum commutatum* Mett. *ex* Kuhn, Ann. Mus. Bot. Lugd. Bat. 4: 292. 1869. Type from Ceylon, *Thwaites 1310* (B, two sheets seen, one of them also containing a frond of *Elaphoglossum angulatum*).

E. subellipticum Rosenstock, Hedwigia 56: 348. 1915, *syn. nov.* Type from Taiwan, *Faurie 488* (B, one sheet).

Other specimens seen: Ceylon, collector unknown, *60-7*, as *Acrostichum conforme* (B, two sheets); Taiwan, Pasienshan, *S. Suzuki s.n.* Oct. 23, 1929 (TAI).

164. Morton (1967) 39.

165. **Asplenium serricula** Fée, Mém. Fam. Foug. 5: 296. 1852; Sledge (1965) 255. Type from Ceylon, *Gardner 30*, not seen; a specimen from Ceylon, *Kubitzki 77-55*, seen in Z.

A. vulcanicum sensu DeVol *et* Kuo in Li *et al.* (1975) 491, *non* Blume.

A. matsumurae Christ, Bot. Mag. Tokyo 24: 241. 1910, *syn. nov.* Type from Taiwan (Lan Yü), seen in P (*Matsumura 83*).

166. Tagawa (1939) 92 as *Asplenium exiguum*, but Wu (1983) 182 pointed out that *A. exiguum* occurs only in S. India and is quite distinct from *A. yunnanense*.

167. Tagawa (1941) 204.

168. **Asplenium neolaserpitiifolium** Tardieu *et* Ching (1936) 153. Type from Hainan, *Katsumata 6706* (P!).

A. cuneatum sensu DeVol *et* Kuo in Li *et al.* (1975) 482, *non* Lam.

169. Ching *et* Iwatsuki (1982) 130.

170. Taxonomy after Morton (1973) 223.

171. **Asplenium tenuicaule** Hayata, Ic. Pl. Form. 4: 228. 1914. Type from Taiwan, *Hayata et Sasaki* (TI!).

A. subvarians Ching in C. Chr. Ind. Fil. Suppl. 3: 38. 1934.—*Gymnogramma fauriei* Christ, Bull. Herb. Boiss. II. 2: 561. 1902, *syn. nov.*, *non A. fauriei* Christ 1899. Type from Japan, *Faurie* (P!).

A. varians sensu DeVol *et* Kuo in Li *et al.* (1975) 490, *non* Wall. *ex* Hook. *et* Grev.

172. Nakaike (1982b) 614. Only one collection in TAI, *Fukuyama 4801*.

173. Taxonomy after Ching in Chien *et* Chun (1959) 286.

174. Nomenclature after Pichi Sermolli (1977b) 91.

175. Taxonomy after Ching in Chien *et* Chun (1959) 301.

176. Iwatsuki *et* Price (1977) 554.

177. **Nephrolepis multiflora** (Roxburgh) Jarrett *ex* Morton (1974) 309.—*Davallia multiflora* Roxburgh, Calcutta J. Nat. Hist. 4: 515, *t. 31-left*. 1844. Lectotype, selected by Morton, in BR, not seen; *no. 1031* in the herbarium of the East India Company at Kew, mentioned by Morton, seen.

N. hirsutula sensu DeVol *et* Kuo in Li *et al.* (1975) 322, *non* (Forst.) Presl.

178. Nakaike (1982b) 591.

179. **Blechnum insigne** (Hook.) Kuo, *comb. nov.*
Bowringia insignis Hook. J. Bot. 5: 237. 1853. Syntypes from Hong Kong and Khasya hills.

180. Key to the Taiwanese species of *Lepisorus*, slightly modified from Tagawa (1942) 307

1. Rhizome scales concolorous, cells all clear..... 2.
1. Rhizome scales discolorous..... 6.
2. Lamina herbaceous or chartaceous; veins more or less distinct..... 3.
2. Lamina coriaceous or chartaceous; veins quite hidden..... 4.
3. Scales 4 mm long, obtuse or acutish, subentire .....*L. kuchenensis*
3. Scales 2–3 mm long, long-acuminate, with sharp, remote, long-protruding teeth on margin.....*L. clathratus*
4. Fronds narrowly-linear, 3–7 mm wide, sori hardly over 2.5 mm in diameter when mature.....*L. pseudo-ussuriensis*
4. Fronds elliptic to lanceolate, 10–15 mm wide, sori much larger, to 4 mm in diameter when mature..... 5.
5. Scales ovate, about 1 mm long, obtuse or acutish, entire or erose .....*L. kawakamii*
5. Scales ovate-acuminate to ovate-lanceolate, 2–3 mm long, denticulate or ciliate-denticulate on margin.....*L. megasorus*
6. Lumina of scales all clear.....*L. morrisonensis*
6. Lumina of central cells of scales opaque, marginal cells clear..... 7.
7. Rhizome 1–1.5 mm thick when dry, leaves distant.....*L. monilisorus*
7. Rhizome 2–3 mm thick when dry, leaves usually clustered..... 8.
8. Lamina broadest below the middle..... 9.
8. Lamina broadest at the middle .....10.
9. Scales subentire, brown; lamina abaxially glabrous....*L. obscure-venulosus*
9. Scales ciliate-denticulate, fuscous; lamina sparsely scaly beneath .....*L. suboligolepidus*
10. Lamina lanceolate, 10–18 mm wide, chartaceous or nearly herbaceous .....*L. tosaensis*
10. Lamina linear or linear-lanceolate, 5–10 mm wide, coriaceous ..... *L. thunbergianus*

181. Tagawa (1942) 306.

182. Tagawa (1936) 109.

183. Tagawa (1942) 303.

184. Tagawa (1942) 305.

185. The type of *Crypsinus veitchii* (Bak.) Copel. is from Japan (K!). The species is characterized by thinly herbaceous fronds, the lowest pinnae being more or less obtuse and pointing to side. Specimens named *C. veitchii* from Taiwan are all smaller plants of *C. quasidivaricatus*. It is concluded that *C. veitchii* does not occur in Taiwan.

186. Nomenclature after Copeland (1947) 197, because of preoccupation of the name *Microsorium longissimum* Fée (see Christensen, 1905–06, p. 429).

187. **Microsorium henryi** (Christ) Kuo, *comb. nov.*—*Polypodium henryi* Christ,

Bull. Herb. Boiss. 6: 873. 1898. Type from Yunnan, *Henry 9780* (two isotypes seen in Z).

Microsorium fortuni sensu DeVol *et* Kuo in Li *et al.* (1975) 196, *non* (Moore) Ching.

The holotype of *Drynaria fortuni* T. Moore, Gard. Chron. 708. 1855, on which the name *Microsorium fortuni* (Moore) Ching is based, is the specimen with two fronds and marked "*no. 18*", although there are four specimens in the type folder in Kew. After a careful study under dissecting microscope, scale-like paraphyses were frond on the sori of mentioned holotype, so that *Drynaria fortuni* should be transferred to *Lepisorus*, **Lepisorus fortunii** (T. Moore) Kuo, *comb. nov.*

188. Kurata *et* Nakaike (1981) 492.

189. Price (1982) 202 reduced *Polypodium steerei* Harr. to *P. punctatum*; his treatment is accepted here.

190. *Colysis shintenensis* (Hayata) H. Ito is considered by Lellinger (1968) 155 as a hybrid, and is not counted in this list.

191. **Colysis pothifolia** (Don) Presl, Epim. Bot. 148. 1849.—*Hemionitis pothifolia* Don, Prod. Fl. Nepal. 13. 1825. Type from Nepal, *Hamilton*, not seen.

Colysis elliptica sensu DeVol *et* Kuo in Li *et al.* (1975) 170, *non* (Thunb.) Ching.

192. Tagawa (1954) 73.

Polypodium atkinsoni sensu DeVol *et* Kuo in Li *et al.* (1975) 202, *non* C. Chr.

193. **Polypodium formosanum** Bak. Journ. Bot. 23: 105. 1885. Type from Taiwan, *Hancock 50* (K!).

P. raishaense Rosenst. Hedw. 56: 346. 1915, *syn. nov.* Type from Taiwan, *Faurie 219* (isosyntype, P!, B!).

The only difference between *Polypodium formosanum* and *P. raishaense* is the absence or presence of rhizome scales. *P. formosanum* grows between 500–1,000 m, in more or less open places, *P. raishaense* at higher elevations, between 1,000–2,000 m, in dense forest. The loss of rhizome scales may be due to the change of habitat from humid to drier places, because the forests below 1,000 m in Taiwan have been more or less destroyed for cultivation. The reduction of *P. raishaense* to *P. formosanum* is suggested because of priority, although the name *P. raishaense* seems to apply to the more typical form of the species.

194. **Pyrrosia angustissima** (Giesenh. *ex* Diels) Kuo, *comb. nov.*

Niphobolus angustissimus Giesenh. *ex* Diels, Engl. Jahrb. 29: 207. 1900. Type from China, *Henry 5137* (K!).

195. Tagawa (1949) 118.

196. Tagawa (1949) 118.

197. Tagawa (1949) 119.

198. Key to the species of *Loxogramme* in Taiwan

1. Rhizome short-creeping, leaves close..... 2.
2. Rhizome long-creeping, leaves distant..... 3.
2. Leaves to 15 cm×1 cm; rachis strongly raised on the abaxial surface .....*L. chinensis* (*L. confertifolia*)
2. Leaves to 40 cm×4 cm; rachis almost flat on the abaxial surface ..... *L. formosana*

3. Rhizome under 1 mm thick when dry; leaves spathulate, usually less than 10 cm long.....*L. grammitoides*
3. Rhizome thicker; leaves usually much longer, oblanceolate to nearly linear ..... 4.
4. Stipe purplish-black, shining; apex of frond caudate-acuminate .....*L. remote-frondigera*
4. Stipe not dark and shiny; frond apex acute or acuminate .....*L. salicifolia* (*L. biformis*)

The key is modified from Tagawa (1943), some of the names used by Tagawa (1943) (in brackets) have been replaced by corrected ones. The corrections are on the authority of Mr. M.G. Price of the University of Michigan (personal communication).

199. Tagawa (1943) 120, as *Loxogramme confertifolia* Tagawa.
200. Iwatsuki *et* Price (1977) 568.
201. Iwatsuki *et* Price (1977) 568.
202. **Ctenopteris mollicoma** (Nees *et* Bl.) Kunze, Bot. Zeit. 4: 425. 1846.—*Polypodium mollicomum* Nees *et* Blume, Nova Acta 11: 121, *pl. 12, f. 2.* 1923.
Ctenopteris brevivenosa sensu DeVol *et* Kuo (1978), *non* (v. A. v. R.) Holttum.
203. DeVol (1979) 12.
Grammitis dorsipila (Christ) C. Chr. *et* Tard.-Blot should be excluded from the fern flora of Taiwan, because the specimen on which the name in Li *et al.* (1975) 222 is based is *G. fenicis* Copel.
204. DeVol (1979) 12 reduced *Grammitis latifolia* DeVol to *G. fasciculata* Blume, but as Parris (1983) 154 pointed out, *Grammitis intromissa* (Christ) Parris is the correct name, although she failed to mention that this species also occurs in Taiwan.
205. Parris (1983) 94, map 27.
Grammitis setosa sensu DeVol in Li *et al.* (1975) 223, *non* Blume.
206. Yamamoto (1932) 6.

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4. ELEVATIONAL AND PHYTOGEOGRAPHICAL DISTRIBUTION PATTERNS OF TAIWANESE PTERIDOPHYTES

Liu (1968-1971) published the main overall description of vegetation zones of Taiwan. The account in Li *et al.* (1975) 6-13 is mainly based on Liu's work, with slight modification. On the basis of variations in physiography and floristic composition, seven vegetation zones can be recognized as shown in Table 1 and Figures 3-10.

Table 1. Vegetation zones of Taiwan with their correlated altitudes and dominant tree species

Vegetation zones	Altitude	Dominant tree taxa
Alpine vegetation	above 3,500 m	*Juniperus squamata* (shrub)
Subalpine coniferous forest zone	3,000-3,500 m	*Abies kawakamii*
Cold temperate coniferous forest zone	2,500-3,000 m	*Tsuga formosana, Picea morrisonicola*
Cool temperate coniferous forest zone	1,800-2,500 m	*Chamaecyparis* spp.
Warm temperate mixed forest zone	700(S), 500(N) -1,800 m	*Fagaceae, Lauraceae*
Subtropical forest zone	below 700m(S), 500m(N)	*Ficus* spp.
Coastal vegetation	seaside	Mangrove, *Barringtonia asiatica, Guettarda speciosa*

Fig. 3. Alpine vegetation: showing rocky peaks, rocky slope and ***Juniperis squamata*** (Buch.-Hamilt.) Ant. scrub vegetation. (Yü Shan, alt. 3,900 m).

Fig. 4. Pure stand of ***Abies kawakamii*** (Hayata) T. Ito: only one tree layer seen, with very poor fern flora. (Yü Shan, alt. 3,100 m).

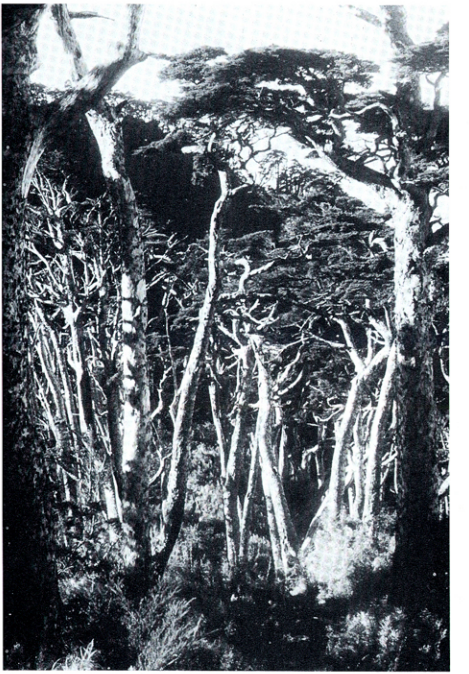

Fig. 5. Forest of ***Tsuga formosana*** Hayata: compared to ***Abies kawakamii,*** the tree trunks of ***T. formosana*** are whitish and not so straight; this forest contains only one tree layer and is usually associated with shrub-like bamboos, ***Yushania niitakayamensis*** (Hayata) Keng f. (Peitawu Shan, alt. 2,900 m).

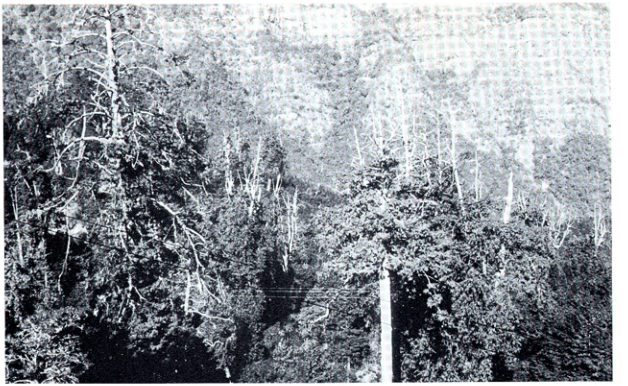

Fig. 6. ***Chamaecyparis*** forest on very steep rocky slope: with three tree layers, top layer is ***Chamaecyparis***, the second and third layers are broad-leaved trees. (Ali Shan, alt. 2,400 m).

Fig. 7. Warm temperate forest, dominated by Fagaceous and Lauraceous trees: with numerous woody vines and dense undergrowth, two tree layers can be seen; 43% of Taiwanese pteridophytes are confined to this vegetation. (Hsitou, alt. 1,500 m).

Fig. 8. ***Ficus*** spp. (middle, lower left and right) in a more or less primeval subtropical forest: this is the typical vegetation in the lowland. (Southeast of Taipei City, alt. 200 m).

Fig. 9. Coastal vegetation: from left to right, coral rocks, sandy beach flourished with ***Ipomoea pes-caprae*** (L.) Sweet subsp. ***brasiliensis*** (L.) Ooststt. and some scattered ***Crinum asiaticum*** L., patchs of ***Pandanus odoratissimus*** L.f. var. ***sinensis*** (Warb.) Kanehira in the middle and right middle. (Lü Tao).

Fig. 10. Mangrove: pure stand of ***Kandelia candel*** (L.) Druce in brackish water in the muddy flat along the mouth of Tanshui River in the north. (Tanshui).

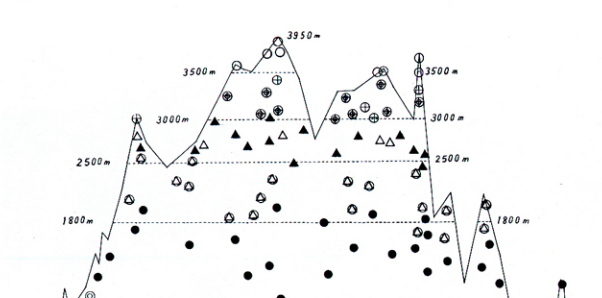

Fig. 11. Elevational distribution patterns of Taiwanese pteridophytes:
○ = *Lycopodium appressum* (Desv.) V. Petr.;
⊕ = *Adiantum taiwanianum* Tagawa;
⊕ = *Lycopodium veitchii* Christ;
△ = *Onychium lucidum* (Don) Sprengel;
▲ = *Dryopteris wallichiana* (Spr.) Alston et Bonner;
◬ = *Polypodium amoenum* Wall. *ex* Mett.;
● = *Dryopteris formosana* (Christ) C. Chr.;
◎ = *Psilotum nudum* (L.) Pal. Beauv.

The elevational distribution patterns of some Taiwanese patridophytes are shown in Figure 11; they agree very well with the distribution of vegetation zones in Taiwan. Actually all Taiwanesee pateriodophytes can be assembled into different groups according to different elevational vegetation zones, but because of the topographic complexity of the Taiwanese mountain system and ecological disturbance, for example, a subtropical fern (*Nephrolepis auriculata*) may occur up to 2400 m through the construction of truck roads, a warm-temperate fern (*Dennstaedtia scabra*) can be found on mountain peaks of the subtropical zone and in ravines of the cool-temperate zone owing to the similarity of microclimate. In the following paragraphs all pteridophytes are assigned to different vegetation zones and every species is listed only under its original vegetation zone, i.e. *Nephrolepis auriculata* in the subtropical zone and *Dennstaedtia scabra* in the warm-temperate zone. Fern species listed in the following are referred to only by species number as given in Chapter 2. Their distribution pattern is indicated by a letter (explained in Table 2) in brackets.

Alpine vegetation

1(W), 42(W), 144(H), 145(W), 162(H), 349(H), 350(H), 351(H), 382(T), 388(H), 389(H), 390(H), 391(H), 392(H), 401(H), 445(W), 452(T), 483(W), 490(W), 506(J), 547(H).

Table 2. Elevational and phytogeographical distribution patterns of Taiwanese pteridophytes*

Phytogeographical distribution patterns / Elevational distribution patterns	W	P	A	H	J	C	M	T	?	Total
Above 3,500 m	6			12	1			2		21
3,000–3,500 m	4			2				1		7
2,500–3,000 m	5	1	1	16	2			7		32
1,800–2,500 m	2	2	7	54	6		1	15		87
500 (N), 700 (S)–1,800 m		14	45	13	28	95	36	31	1	263
Below 500 (N), 700 (S)		32	48		9	60	30	10		189
Seaside		3	1		2					6
Total (coniferous zones / broad-leaved zones)	17 (17/0)	52 (3/49)	102 (8/94)	97 (84/13)	48 (9/39)	155 (0/155)	67 (1/66)	66 (25/41)	1 (0/1)	605 (147/458)

* Twelve species entirely confined to Lan Yü are not included.
W=Temperate element (Fig. 19); P=Pantropical (mostly Old World tropical) element (Fig. 20); A=Asiatic element (Fig. 21); H=Himalayan and/or West Chinese element (Fig. 22); J=North Chinese, East Chinese, and/or Japanese element (Fig. 22); C=South Chinese element (Fig. 22); M=Malesian element (Fig. 22); T=Endemic or Taiwanese element; ?=Unknown.

Fig. 12. *Cryptogramma brunoniana* Wall. *ex* Hook. *et* Grev., a typical alpine fern of Taiwan, found only on rocky slopes above the tree line. (Yü Shan, alt. 3,900 m).

Fig. 13. ***Lepisorus morrisonensis*** (Hayata) H. Ito, growing on open, rocky cliffs, from 2,700 m to 3,600 m. The elevational distribution pattern of this species agrees with that of ***Abies kawakamii*** (Hayata) T. Ito. (Yü Shan, alt. 3,100 m).

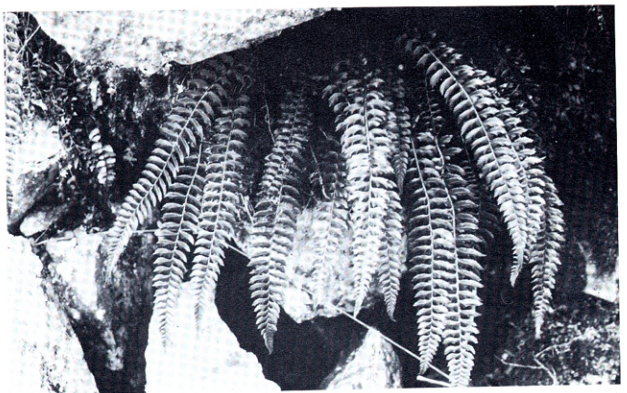

Fig. 14. ***Polystichum nepalense*** (Spreng.) C. Chr., growing on rocky cliffs in open places of ***Tsuga*** forest (***T. formosana*** Hayata), from 2,400 m to 3,100 m. (Yü Shan, alt. 2,700 m).

Fig. 15. ***Trichomanes latifrons*** v. d. Bosch, the only filmy fern growing in cool-temperate vegetation in Taiwan; other filmy ferns are confined lower altitudes. This species grows on humid, humus-rich, rocky slopes in coniferous (first tree layer) and broad-leaved (second and third tree layers) mixed forest, from 1,800 m to 2,400 m. (Nanhu Tashan, alt. 2,300 m).

Subalpine coniferous forest zone

18(W), 19(W), 20(H), 48(W), 161(T), 482(W), 551(H).

Cold temperate coniferous forest zone

22(T), 44(H), 57(W), 58(W), 128(W), 148(H), 222(A), 252(W), 256(H), 302(T), 342(P), 343(H), 344(H), 345(W), 346(H), 347(H), 352(J), 353(H), 361(T), 384(H), 398(H), 425(H), 430(T), 431(T), 446(H), 449(H), 450(T), 451(J), 456(H), 561(H), 566(T), 582(H).

Cool termperate coniferous forest zone

2(T), 3(T), 9(J), 11(T), 16(H), 17(A), 21(H), 35(H), 43(H), 76(H), 95(H), 111(T), 132(H), 133(H), 152(H), 172(H), 186(H), 215(H), 250(H), 257(H), 258(H), 260(A), 293(P), 294(H), 295(A), 300(H), 301(T), 303(H), 333(H), 338(H), 339(J), 340(T), 348(H), 354(H), 355(H), 356(H), 357(H), 360(A), 371(H), 372(T), 373(H), 375(H), 376(H), 379(H), 380(H), 381(H), 387(H), 394(A), 395(H), 399(J), 420(H), 426(T), 427(H), 428(H), 429(J), 432(H), 433(H), 435(H), 437(A), 439(H), 440(H), 441(T), 442(H), 443(H), 447(J), 464(H), 472(P), 475(H), 488(W), 489(J), 497(W), 504(H), 505(H), 514(T), 515(A), 521(M), 530(H), 533(H), 535(H), 536(T), 548(T), 560(T), 564(T), 581(H), 591(H), 596(T), 601(H).

Fig. 16. ***Dryopteris formosana*** (Christ) C. Chr., strongly associated with primeval Fagaceous and Lauraceous broad-leaved forest, normally growing on humus-rich, middle slopes in the forest. Its elevational range is from (700 m)-1,000 m to 1,800 m-(2,400 m), but within the range of 700 m and 1,000 m, ***D. formosana*** is found usually on the tops or ridges of hills; within 1,800 m-2,400 m it occurs in valleys. (Nanhu Tashan, alt. 2,300 m, in a valley).

Fig. 17. ***Thelypteris simplex*** (Hook.) K. Iwats., terrestrial on forest floor in light shade, the picture showing its dimorphous fronds. Although this species is not very common in the lowland (below 700 m) of Taiwan, the frequency of its presence is rather high. (Nanjen Shan, 300 m).

Fig. 18. ***Pteris fauriei*** Hieron., a common seaside fern in ***Pandanus*** scrub vegetation or in the shade of huge rocks near sandy beach, rarely occurring up to 700 m in the forest (the individuals in this case are supposed to be a cytological variant, this requires further study). (Chialeshui, seaside).

Warm temperate mixed forest zone

4(A), 8(T), 10(P), 13(J), 14(J), 23(A), 24(A), 28(J), 30(A), 31(A), 32(J), 38(T), 39(P), 45(A), 56(A), 65(C), 66(A), 67(C), 68(C), 72(A), 74(A), 75(T), 77(C), 80(M), 81(J), 82(J), 83(A), 84(A), 85(M), 86(A), 87(M), 88(T), 89(M), 92(M), 94(C), 96(T), 98(M), 100(M), 102(A), 112(C), 113(J), 114(C), 115(C), 116(C), 117(C), 124(M), 127(P), 129(A), 130(C), 131(C), 135(C), 136(C), 137(T), 138(T), 139(C), 141(A), 142(C), 143(A), 146(A), 151(?), 154(C), 156(C), 158(A), 159(P), 160(J), 163(M), 165(A), 166(P), 167(T), 168(T), 169(A), 173(C), 174(J), 175(C), 176(C), 177(T), 179(J), 182(P), 183(P), 184(T), 185(T), 190(A), 191(A), 193(C), 194(M), 199(C), 200(A), 203(C), 209(J), 210(J), 213(A), 216(T), 217(C), 220(A), 221(C), 224(M), 225(P), 226(A), 227(P), 240(A), 245(C), 246(J), 247(C), 248(C), 249(C), 254(M), 255(C), 261(C), 262(C), 264(C), 265(C), 266(A), 268(A), 269(C), 270(C), 271(A), 279(H), 289(T), 290(J), 291(H), 292(H), 310(C), 312(A), 314(C), 318(A), 322(M), 323(T), 324(C), 325(C), 328(C), 330(C), 331(T), 332(A), 334(C), 335(T), 336(J), 337(C), 341(C), 358(A), 365(T), 366(C), 367(T), 368(C), 374(C), 377(C), 378(T), 383(J), 385(C), 386(T), 393(A), 396(T), 397(H), 400(C), 405(C), 406(C), 407(C), 408(C), 414(H), 415(C), 416(T), 417(M), 418(J), 422(C), 423(A), 424(C), 434(J), 436(C), 438(H), 444(C), 448(A), 453(A), 454(J), 457(C), 458(A), 459(A), 460(M), 461(P), 462(H), 468(H), 473(C), 474(M), 476(M), 477(M), 479(J), 480(H), 481(H), 484(C), 487(P), 491(J), 492(C), 493(C), 494(M), 495(C),

496(C), 498(C), 499(C), 500(A), 501(C), 502(T), 503(P), 507(H), 508(C), 509(H), 510(A), 512(A), 513(P), 516(C), 517(J), 522(M), 523(P), 528(C), 529(C), 531(C), 538(M), 542(M), 543(C), 545(A), 546(C), 549(T), 550(T), 552(T), 553(C), 554(C), 555(C), 557(C), 558(C), 559(C), 563(C), 565(J), 567(J), 571(C), 574(C), 577(C), 579(C), 580(T), 583(C), 584(C), 585(T), 587(J), 588(C), 589(C), 590(T), 592(T), 593(C), 594(H), 595(C), 598(M), 599(M), 600(M), 602(M), 603(M), 604(M), 605(M), 606(M), 607(M), 608(M), 609(M), 610(M), 611(J), 612(M), 613(J), 614(J), 615(M).

Subtropical forest zone

5(C), 6(M), 7(C), 12(M), 15(P), 25(A), 26(M), 27(C), 29(C), 33(A), 34(J), 36(C), 37(C), 40(A), 41(P), 46(P), 47(P), 50(A), 52(J), 53(M), 54(T), 55(T), 59(C), 60(A), 61(P), 62(P), 63(A), 64(P), 69(P), 70(A), 71(A), 73(A), 78(M), 79(A), 90(P), 91(M), 93(M), 97(M), 99(M), 101(M), 103(M), 104(C), 106(M), 107(M), 108(M), 109(M), 110(P), 118(T), 119(A), 120(J), 121(C), 122(C), 123(C), 126(C), 134(A), 140(A), 147(A), 149(P), 150(A), 153(P), 155(P), 157(A), 164(A), 170(P), 171(A), 178(C), 180(C), 181(A), 188(A), 189(C), 195(C), 197(T), 198(A), 201(M), 202(M), 204(A), 205(C), 206(C), 207(T), 208(A), 211(T), 212(C), 214(P), 218(M), 219(M), 223(P), 229(P), 230(T), 231(A), 232(P), 233(P), 234(C), 235(A), 236(A), 237(A), 238(M), 239(M), 241(J), 243(M), 253(C), 259(C), 263(P), 267(C), 272(P), 273(P), 274(C), 275(C), 276(T), 277(C), 278(A), 280(C), 282(A), 283(P), 284(P), 285(C), 286(A), 287(M), 288(C), 296(C), 297(T), 298(C), 299(C), 304(C), 305(A), 306(M), 307(C), 308(C), 309(A), 311(A), 313(A), 315(C), 316(C), 317(C), 319(C), 320(C), 321(A), 326(A), 327(A), 329(A), 359(J), 362(C), 363(J), 364(T), 370(C), 402(C), 403(C), 404(C), 409(C), 410(C), 411(J), 412(J), 413(J), 419(C), 421(A), 455(A), 463(P), 465(A), 466(M), 467(M), 469(C), 470(M), 471(M), 478(P), 485(P), 511(P), 518(M), 519(C), 520(A), 525(A), 526(P), 527(P), 532(C), 534(A), 537(C), 539(C), 540(C), 541(M), 544(C), 556(C), 568(A), 570(C), 572(A), 573(A), 576(C), 578(C), 586(A), 897(C), 616(P), 617(P).

Coastal vegetation

187(J), 192(P), 228(A), 369(J), 569(P), 575(P).

Conclusion to be drawn from Table 1

1. As expressed by the physiognomy of the vegetation and its dominat tree species, the forests of Taiwan from 1800 m upwards are dominated by coniferous trees, and below 1800 m by broad-leaved trees.
2. All temperate element and most of the Himalayan and/or West Chinese element are in the coniferous zoness. All temperate element also occur in the Himalayan region.
3. All pantropical element and Asiatic element of the coniferous forests also occur in the Himalayan region.
4. Most of the North Chinese, East Chinese, Japanese, and Malesian element occurring in the coniferous zones are either rare species or are found only in secondary vegetation. These are considered less important and are discussed in Chapter 5.

Fig. 19. Distribution map of *Botrychium lunaria* (L.) Sw. (Temperate element, marked as "w" in Table 2).

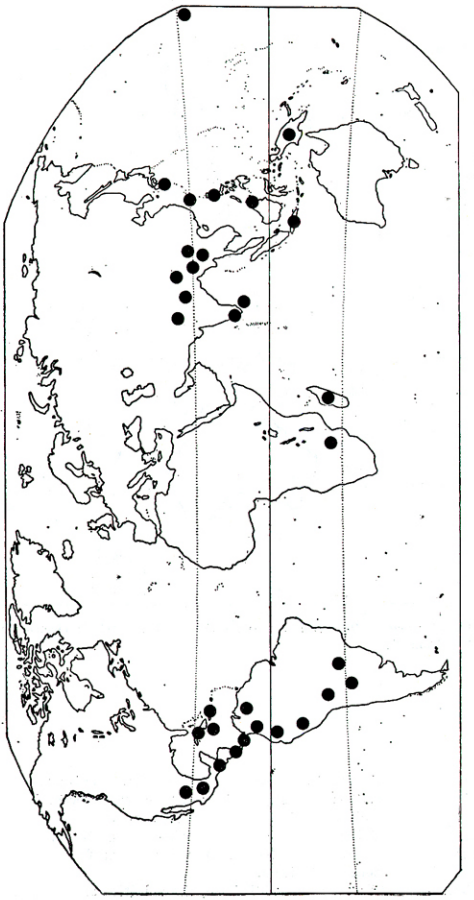

Fig. 20. Distribution map of ***Dryopteris wallichiana*** (Spreng.) Hyl. (Pantropical element, marked as "P" in Table 2).

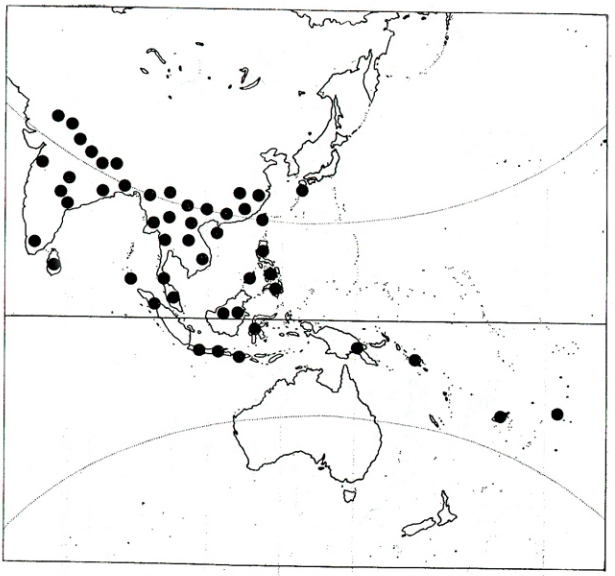

Fig. 21. Distribution map of *Diplazium esculentum* (Retz.) Sw. (Asiatic element, marked as "A" in Table 2).

5. There are 25 endemic species or representatives of the Taiwanese element in the coniferous zones. The closest relatives of 20 of these occur in the Himalayan and/or West Chinese regions, as shown in Table 3.
6. Out of a total of 147 fern species found in the coniferous zones, 132 emphasize a close relationship between the floras of the Himalayan-West Chinese region and the coniferous zones of Taiwan.
7. In the broad-leaved forest zones of Taiwan, the affinities of the ferns are more

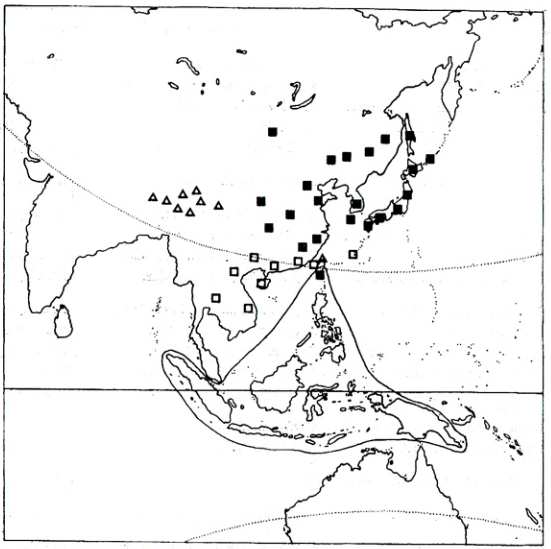

Fig. 22. Distribution map of *Woodsia polystichoides* Eat. (■, North Chinese, East Chinese, and/or Japanese element, marked as "J" in Table 2), *Cryptogramma brunoniana* Wall. *ex* Hook. *et* Grev. (△, Himalayan and/or West Chinese element, marked as "H" in Table 2), *Tectaria phaeocaulis* (Rosenst.) C. Chr. (□, South Chinese element, marked as "C" in Table 2), *Grammitis intromissa* (Christ) Parris (—, slightly modified from Parris (1983) 143, Malesian element, marked as "M" in Table 2).

complicated than in the coniferous zones. The assortment may be arranged as follows, according to species numbers and the ratio of the species number of each phytogeographical distribution pattern to total pteridophytic species number of the broad-leaved forest zones (in brackets): South Chinese element (155, 34%), Asiatic element (94, 21%), Malesian element (66, 14%), Pantropical element (49, 11%), Taiwaneses element (41, 9%), East Chinese and/or Japanese element (39, 9%), Himalayan element (13, 3%).

Table 3. Endemic species or Taiwanese element in the coniferous zones of Taiwan and their closest relatives elsewhere

Endemic species or Taiwanese element	Closest relative and its main area	
1. *Polystichum morii* Hayata	*P. atkinsonii* Bedd.	Himalaya
2. *Woodsia okamotoi* Tagawa	*W. cinnamomea* Christ	West China
3. *Adiantum taiwanianum* Tagawa	*A. roborowskii* Maxim.	West China
4. *Lycopodium yueshanense* Kuo	*L. veitchii* Christ	West China
5. *Crypsinus okamotoi* (Tagawa) Tagawa	*C. rhynchophyllus* (Hook.) Copel.	Himalaya
6. *Ctenitis transmorrisonensis* (Hayata) Tagawa	*C. nidus* (Clarke) Ching	Himalaya
7. *Dryopteris yoroi* Serizawa	*D. sparsa* (Don) O. Ktze.	Himalaya, etc.
8. *Athyrium oppositipennum* Hayata	Specimens called *A. rubicaule*	Himalaya
9. *A. reflexipinnum* Hayata	Specimens named *A. otarioides*	Himalaya
10. *Gymnocarpium remote-pinnatum* (Hayata) Ching	*G. jessoense* (Koidz.) Koidz.	Himalaya, etc.
11. *Lycopodium taiwanense* Kuo	*L. pulcherrimum* Hook. et Grev.	Himalaya
12. *L. somae* Hayata	*L. appressum* (Desv.) Petr.	Himalaya, etc.
13. *L. quasipolytrichoides* Hayata	*L. appressum* (Desv.) Petr.	Himalaya, etc.
14. *Blechnum hancockii* Hance	*B. niponicum* (Kunze) Makino	Japan
15. *Crypsinus echinosporus* (Tagawa) Tagawa	*C. ebenipes* (Hook.) Copel.	Himalaya
16. *C. taiwanensis* (Tagawa) Tagawa	*C. rhynchophyllus* (Hook.) Copel.	Himalaya
17. *Lepisorus pseudo-ussuriensis* Tagawa	*L. ussuriensis* (Regel et Maack) Ching	Manchuria
18. *Loxogramme remote-frondigera* Hayata	*L. duclouxii* Christ	Southwest China
19. *Araiostegia parvipinnula* (Hayata) Copel.	*A. perdurans* (Christ) Copel.	Himalaya
20. *Cyrtomium taiwanense* Tagawa	*C. caryotideum* (Wall. ex Hook. et Grev.) Presl	Himalaya
21. *Dryopteris subatrata* Tagawa	*D. cycadina* (Fr. et Sav.) C. Chr.	Himalaya
22. *Athyrium arisanense* (Hayata) Tagawa	*A. wardii* (Hook.) Makino	East China
23. *A. cryptogrammoides* Hayata	*A. iseanum* Rosenst.	West China, etc.
24. *Ctenitis kawakamii* (Hayata) Ching	*C. mariformis* (Rosenst.) Ching	Southwest Chnia
25. *Plagiogyria formosana* Nakai	*P. glauca* (Bl.) Mett. *P. media* Ching *P. glaucescens* Ching	Malesia Himalaya Himalaya

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5. SELECTIVE CONCEPTS FOR THE COMPARISON OF NEIGHBOURING FLORAS AND THE AFFINITIES OF TAIWANESE PTERIDOPHYTES

As mentioned in the last chapter, 14% (66 species) of the Taiwanese pteridophytes in the broad-leaved vegetation zones belong to the Malesian element, but is it correct to say that the pteridophytic flora in the broad-leaved vegetation zones has 14% affinity to that of the Malesian region? For the distribution record, a rare species known ouly from one collection and an abundant species seen everywhere have the same significance, but from the vegetational view point, this rare species probably means an accidental occurrence secondarily from neighbouring flora, since long-distance dispersal for most of the pteridophytes is very possible, especially in a region with frequent monsoons and typhoons. It is very clear that although there are 605 pteridophytes in Taiwan proper, they are not all equivalently important for the vegetation, and if we use pteridophytes as a reflection of the vegetation, a selection based on certain kind of criteria is necessary.

Selective concepts for the floristic affinities

1. Important site for sampling representative pteridophytes in a vegetation zone:

Figure 23 is the profile of a lowland vegetation from the southeast of Taipei City; it is also a typical sample for that extant in Taiwan as a whole. The figure shows a secondary vegetation with a footpath in the forest (d), fishpond (f), fallow paddyfield (h), footpath beside paddyfield (g, i). The vegetation is dominated by *Cyclobalanopsis glauca* (Thunb.) Oerst. at mountain top (a), *Mallotus paniculatus* (Lam.) Muell.-Arg. on mountain side (b), *Trema orientalis* (L.) Blume at the bottom of valley (c-h). *Miscanthus floridulus* (Labill.) Warb. ex Schum. et Laut. occurs hers and there in open places of the secondary forest (a-d, h, j), on the exposed bank of the fishpond (e), and on the footpath by the paddyfield (g).

The mountain system of Taiwan is very much folded, so that in a small area physiographically different sites can be found; the most distinct ones are mountain summit, ridges, slopes, and valleys. These support different plants or groups of plants as shown in Figure 23. *Cyclobalanopsis glauca* is one of the dominant tree species on the mountain slopes in the warm-temperate vegetaton zone; the occurrence of this species on mountain tops in the subtropical vegetation zone may be due to a similar microclimate. Similar distribution types are also faund for other dominant tree species, for example: *Tsuga formosana*, a dominant tree species on the mountain sides of the cold-temperate vegetation zone sometimes also dominates on certain summits in the the cool-temperate vegetation zone (for example, in Taiping Shan, alt. 2000 m). There are 30 Malesian elements in the ferns of the subtropical vegetation zones (Table 4), but almost all of them are either rare (18 species) and/or occur only in ravines (19 species). We may express this by stating that amoung the floristic components of ravines in the subtropical zone there is a

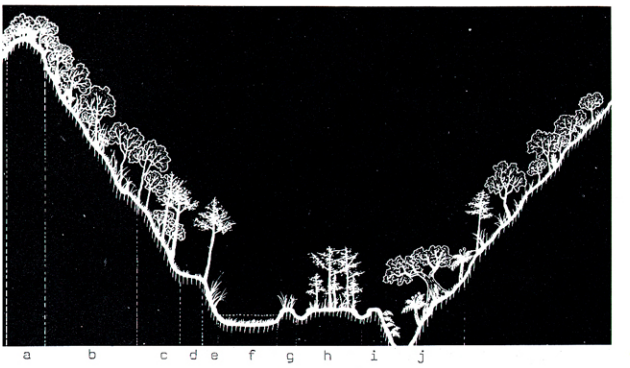

Fig. 23. The profile of a lowland vegetation from the southeast of Taipei City (alt. 200 m). The explanation of this figure is in the text. (Illustrated by Y. F. Chen).

Table 4. Malesian pteridophytes in Taiwan

	R (S)	More abundant species				
		V (S)	II	L	P	Total (S)
Cool-temperate coniferous belt 1,800–2,500 m	1(1)	—	0	0	0	41(1)
Warm-temperate mixed forest belt (N) 500, (S) 700–1,800 m	30(18)	—	2	1	3	36(18)
Subtropical forest belt below (N) 500, (S) 700 m	18(11) (V: 9)	10(8)	2	0	0	30(19) (V: 19)
Total (S)	49(30)	10(8)	4	1	3	67(38)

R=Rare species (example see Fig. 24);
S=Only on the southern slope of Taiwan;
V=In the ravines of the subtropical forest belt (example see Fig. 24);
II=Species of secondary vegetation;
L=Species of limestone areas;
P=Associated with primeval vegetation as low epiphytes.

Fig. 24. ***Lomariopsis spectabilis*** (Kze.) Mett.: a rare climber in subtropical ravines; fertile fronds very rarely found. (Manjen Shan, alt. 300 m).

tropical element, but real tropical vegetation, as occurring in the Malesian region, is absent from Taiwan. From the above discussion follows that the typical vegetation in the mountains of each zone is not that of summits or valleys but that of the slopes.

2. Pteridophytes with a high frequency and associated with original forest are chosen as representative for comparison with neighbouring floras:

The formation of a climax vegetation is through long-term competition, adaptation, and succession, and at last the components of the vegetation maintain certain degree of equilibrium. Plants associated with this vegetation are thus considered more firmly and primarily attached to the land. Sometimes some accidental occurrences are also found in this primeval vegetation, for example all the records of species of *Grammitis* (s. str.) in Taiwan are associated with primeval, so-called "fog-forest" in the warm-temperate vegetation zone on the southern slope of Chung-yang Shanmo (see Chapter 1), so that it is necessary to select species not only from climax vegetation, but also to select those with a high frequency in the vegetation.

3. Pteridophytes in secondary vegetation are not selected:

There are three main types of grassland in Taiwan, each dominated by one graminaceous species, viz. *Yushania niitakayamensis* (Hayata) Keng f. (Fig. 25), *Miscanthus transmorrisonensis* Hayata, and *M. floridulus* (Labill.) Warb. ex Schum. et Laut. They occupy different altitudes and harbour different fern species, as shown in Table 5.

Fig. 25. Short-bamboo grassland of ***Yushania niitakayamensis*** (Hayata) Keng f. gradually invaded by ***Pinus taiwanensis*** Hayata. (Yü Shan, alt. 2,700 m).

Table 5. The three main types of grassland in Taiwan with their dominant species, physiognomy, altitudes, and associated fern taxa

Dominant species	Physiognomy	Altitudes	Associated fern species
Yushania niitaka-yamensis	short bamboo	2,500-3,500 m	*Lycopodium juniperoideum* Sw. *L. veitchii* Christ
Miscanthus trans-morrisonensis	tall grass	1,800-3,000 m	*Pteridium revolutum* (Bl.) Nakai (Fig. 26) ± *L. pseudoclavatum* Ching ± *L. multispicatum* Wilce
Miscanthus floridulus	tall grass	below 500 m (N) 700 m (S)	*P. aquilinum* (L.) Kuhn var. *latiusculum* (Desv.) Underw. ± *L. cernuum* L.

± =only loosely associated with the vegetation.

The fern species associated with secondary vegetation in the lowland are generally abundent in Taiwan and widely distributed in the world, for example, *Pteridium aquilinum* (L.) Kuhn var. *latiusculum* (Desv.) Underw. and *Lycopocium cernuum* L., they are widely distributed in all tropical to warm-temperate regions of the world. In the framework of floristic comparison within a relatively small region like East Asia, these species belong to a higher category; for example, both species ocur in Taiwan and the Malesian region, but this does not mean that thess floristic regions have a close affiinity; actually, as shown ih Table 4, most species of the Malesin element in Taiwan are in a less important position. The reason is that the floristic components in secondary vegetation do not reflect the typical vegetation in a certain area.

The affinities of the Taiwanese pteridophytes in the broad-leaved forest zones

As revealed in Chapter 4, the Taiwanese pteridophytes in the coniferous forest zones show a close relationship to those of the Himalayan region, but those of the broad-leaved farest zones are composed of various elements. As shown by an analysis of all species of the Malesian element (Table 4), most of them are either rare speies or confined to ravines in the subtropical zone. Apparently the Taiwanese pteridophytes in the broadleaved forest zones are not closely linked to those of the Malesian region. In the last paragraph three selective criteria based on criteria of the vegetation are discussed. According to these criteria a number of representative pteridophytes have been selected in order to clarify the true affinities of the pteridophytes of the broad-leaved vegetation zones.

Selected pteridophyhytes of the warm-temperate forest zone

4(A), 84(A), 94(C), 112(C), 114(C), 115(C), 116(C), 130(C), 131(C), 175(C), 193(C), 200(A), 203(C), 217(C), 245(C), 247(C), 248(C), 255(C), 261(C), 292(H), 324(C), 328(C), 332(A), 337(C), 341(C), 358(A), 365(T), 366(C), 368(C), 377(C), 378(T), 386(T), 393(A), 407(C), 408(C), 414(H), 415(C), 416(T), 422(C), 424(C), 448(A), 457(C), 458(A), 459(A), 468(H), 479(J), 480(H), 481(H), 484(C), 487(P), 493(C), 498(C), 499(C), 500(A), 502(T), 503(P), 508(C), 509(H), 516(C), 517(J),

Fig. 26. ***Pteridium revolutum*** (Bl.) Nakai, associated with young stages of ***Miscanthus transmorrisonensis*** Hayata tall-grass vegetation, on newly burned mountain sides; middle left: ***Pinus taiwanensis*** Hayata, upper part: ***Salix*** spp. (Yü Shan, alt. 2,000 m).

531(C), 543(C), 553(C), 557(C), 559(C), 567(J), 571(C), 574(C), 577(C), 579(C), 588(C), 595(C), 602(M), 603(M), 611(J), 613(M).

Selected pteridophytes of the subtropical forest zone

7(C), 27(C), 41(P), 46(P), 52(J), 59(C), 195(C), 198(A), 212(C), 274(C), 280(C), 285(C), 286(A), 296(C), 297(T), 298(C), 304(C), 305(A), 308(C), 319(C), 327(A), 359(J), 363(J), 402(C), 403(C), 412(J), 463(P), 469(C), 478(P), 540(C), 556(C), 570(C), 576(C), 578(C).

Selected pteridophytes in the two broad-leaved vegetation zones are assembled according to their phytogeographical patterns in Table 6. Six pantropical species and fourteen Asiatic species have been selected; they are considered as character species of larger areas like the tropics of the world whole or of all Asia, so that Taiwan shares these species with at least Japan, China, and Malesia. 90 other species, not belonging to "P" or "A" in Table 6, are considered as differential species in an area comprising Japan, Malesia, and the Himalayan region; 67 species (74% of the pteridophytic differential species) are indicative of a close relationship between the floras of southern China and Taiwan; combined with other 23 species they constitute a part of the typical broad-leaved vegetation in Taiwan.

The distribution patterns of the species of the South Chinese element in the

Table 6. Selected pteridophytes in broad-leaved vegetation zones assembled according to different phytogeographical distribution patterns

	P	A	H	J	C	M	T	Total
500 (N), 700 (S)-1,800 m	2	10	6	4	46	3	5	76
Below 500 m (N), 700 m (S)	4	4	0	4	21		1	34
Total	6	14	6	8	67	3	6	110

P=Pantropical or, mostly, Old World tropical element;
A=Asiatic element;
H=Himalayan and/or West Chinese element;
J=North Chinese, East Chinese, and/or Japanese element;
C=South Chinese element;
M=Malesian element;
T=Endemic or Taiwanese element.

broad-leaved forest zones of Taiwan can apparently be subdivided into two types; one types is more restricted to SW. China, N. Indo-China, and NE. India (Fig. 27); another type is more confined to SE. China, the Ryukyus, and the lowlands of Indo-China (Fig. 22, *Tectaria phaeocaulis*). Most of the selected pteridophytes in the warm-temperate vegetation zone have the former distribution pattern, those from the subtropical vegetation zone have the latter distribution pattern.

Conclusion (Fig. 28)

1. The pteridophytic flora of Taiwan have very weak relationships to that of Malesia.

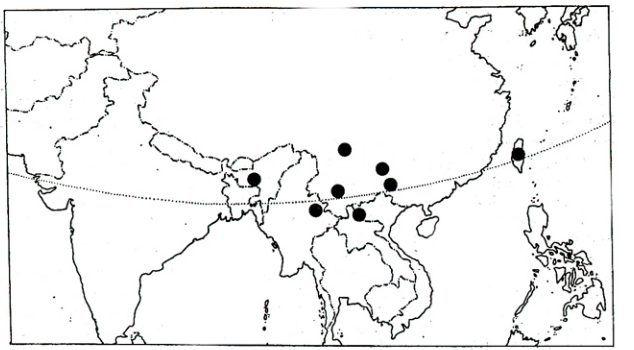

Fig. 27. Distribution map of ***Thelypteris griffithii*** (Moore) Kuo, a representative species from warm-temperate vegetation zone of Taiwan, also distributed in SW. China (Szechwan, Kweichow, Yunnan), N. Indo-China and NE. India.

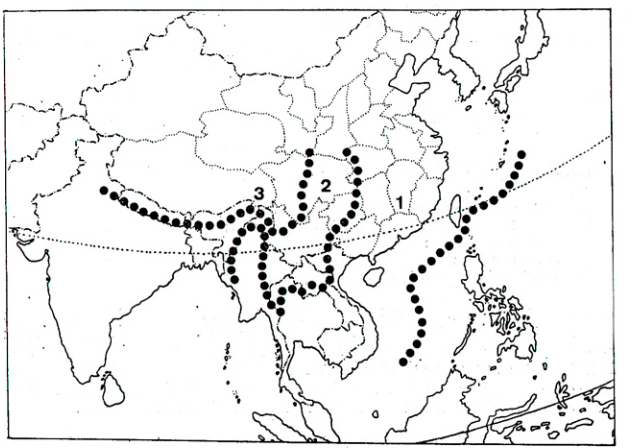

Fig. 28. Phytogeographical links of Taiwaness pteridophytes:
1. Subtropical Taiwan: the Ryukyus, SE. China, lowlands of Indo-China;
2. Warm-temperate Taiwan: SW. China, N. Indo-China, NE. India;
3. Coniferous zones of Taiwan: southern part of West China, Himalaya.

2. The pteridophytes in the subtropical zone of Taiwan are closely related to those of the Ryukyus, SE. China, and the lowlands of Indo-China.
3. About 43% the Taiwanese pteridophytes belong to the warm-temperate vegetation zone; they are closely related to the pteridophytes of SW. China (especially Szechwan, Yunnan, Kweichow), also of N. Indo-China and NE. India.
4. The pteridophytes of the coniferous zones of Taiwan and the Himalaya are closely related, as mentioned in Chapter 4.

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K	The Herbarium and Library, Royal Botanic Gardens. Kew
KYO	Department of Botany, Kyoto University
L	Rijkherbeidium, Leiden
P	Muséum National d'Historie Naturelle, Laboratoire de Phanérogamie, Paris
TI	Botanical Institute, Tokyo University
TNS	National Science Museum, Tokyo
TOFO	Section of Forestry Botany, University Museum, Tokyo
U	Botanical Museum and Herbarium, Utrecht

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論臺灣的蕨類植物及其地理親緣關係

郭 城 孟

摘 要

臺灣的蕨類植物種類繁多顯然與其地理位置、地形、氣候有關。由臺灣蕨類植物的採集史，進而指出許多亞洲植物命名上的問題，必須追溯至現存於歐洲標本館，早期採自亞洲的標本。

本研究材料主要來自作者自行收集，自民國 57 年至 70 年間野外資料，及自民國 70 年至 73 年間日本、歐洲各大標本館中資料；全臺灣蕨類植物本文確認 617 種，其中包含 4 新種，13 新紀錄種，15 新組合，33 新異名，27 新更正，1/6 的學名在臺灣植物誌第一版中並未提及。

臺灣蕨類植物的垂直分佈，大致與臺灣植被帶的垂直分佈相符，43%的種類生長在臺灣的暖溫帶；在針葉樹林帶的臺灣蕨類植物，大多數是以喜馬拉雅山區爲其分佈中心，同時也尋找此植被帶固有蕨類植物的最親緣種，發現其分佈中心同前。

本文首次提出，將植被學的選擇重要植物觀念，運用在植物地理學上，經用此觀念，得到臺灣闊葉林帶蕨類植物的地理親緣關係如下：一、與馬來西亞植物區系關係極爲薄弱；二、臺灣的亞熱帶與琉球羣島，大陸東南沿海諸省，中南半島低地，應屬同一植物地理單位；三、臺灣的暖溫帶與大陸西南諸省，中南半島北部高地，印度東北角，屬另一植物地理單位。臺灣本島雖然位於馬來西亞植物區系的北緣，但其植物地理親緣關係却顯然偏向亞洲大陸。